MT-020-78-2-117

# ENVIRONMENTAL ASSESSMENT OF SQUIRREL CREEK NONCOMPETITIVE LEASE AREA IN BIG HORN COUNTY, MONTANA

November 3, 1982



U.S. Department of the Interior
Bureau of Land Management
Miles City District Office
Powder River Resource Area

MT-020-78-2-117

# ENVIRONMENTAL ASSESSMENT OF SQUIRREL CREEK NONCOMPETITIVE LEASE AREA IN BIG HORN COUNTY, MONTANA

POWDER RIVER RESOURCE AREA
MILES CITY DISTRICT OFFICE
BUREAU OF LAND MANAGEMENT
P. O. BOX 940
MILES CITY, MONTANA 59301



November 3, 1982

Jim Murkin - Environmental Coordinator

James K. Murkin



Alan Pierson - Powder River Resource Area Manager

Alan R. Pierson

Ray Brubaker - District Manager

Ray Brubaker

This Environmental Assessment
Prepared By
U.S. Department of the Interior
Bureau of Land Management
Miles City District Office
Powder River Resource Area

TABLE OF CONTENTS

## TABLES



## MAPS

EA-MT-020-78-2-117

DECISION RECORD

I. TITLE: Environmental Assessment for Northern Cheyenne and Alluvial Valley Floor Exchanges: Squirrel Creek Coal Area.

This environmental assessment (EA) was prepared in accordance with the Federal Coal Management Program and in compliance with 43 CFR 3400 and 30 CFR 1500. The assessment also develops mitigation measures (stipulations) which will be incorporated into the noncompetitive leases issued to Consolidation Coal Company and Chevron Resources Company. The Bureau of Land Management has signed an agreement with these two companies to issue leases for the Northern Cheyenne Exchange by December 1, 1984.

II. ALTERNATIVES CONSIDERED

A. Proposed Action: Issue noncompetitive leases and exchange coal found unsuitable for mining by an alluvial valley floor determination in areas selected by the companies.

B. Issue noncompetitive leases in areas agreed upon and exchange coal found unsuitable by an AVF determination in an area other than Squirrel Creek.

C. No actions (no leasing or exchange).

III. DECISION AND RATIONALE

A. Decision: Accept the proposed action with the stipulations attached.

B. Rationale: Passage of the "Northern Cheyenne Indian Exchange Legislation" (PL96-401) provided for cancellation of certain leases within the Northern Cheyenne Indian Reservation and negotiations with parties holding such leases for noncompetitive leases for federal coal off the reservation. Consolidation Coal Company and Chevron Resources Company qualified under this law and signed agreements with the Secretary of the Interior to exchange their reservation rights for noncompetitive coal leases of 130 million tons each in the Squirrel Creek area.

In addition to the exchange agreements, Chevron and Consol are equal partners in the proposed CX Ranch mine, which is located in the immediate adjacent area of the exchange agreements. In their mine plan application, portions of Squirrel Creek have been declared an alluvial valley floor by the Montana Department of State Lands and the Office of Surface Mining. This resulted in a denial to mine portions of the companies' fee and federal coal leases. Under Section 510 of the Surface Mining Control and Reclamation Act (PL95-87), the Secretary may enter into an exchange agreement for leased federal coal and must exchange federal coal for fee coal that is precluded from being mined because of an alluvial valley floor determination.

Because the decision to lease or exchange is made by the two laws cited, the Secretary of the Interior has no discretion in considering issue or exchange of coal leases. He is further constrained by the cancellation agreement with the companies to the Squirrel Creek area. Since the

noncompetitive leases must occur in the Squirrel Creek area, any future alluvial valley floor exchange should also occur in this area to minimize environmental impacts and to ensure the exchanged coal would be mineable.

C. Mitigation: The stipulations developed for these noncompetitive leases and coal exchange are attached.

IV. CONCLUSION

I find this document to be an adequate assessment of the proposal and an EIS is not required. I recommend selection of the proposed action. The cumulative effects of a lease and/or exchange will be described in an Environmental Impact Statement to be written by the Montana Department of State Lands before a permit to mine can be issued.

Ray Bruhaker

Ray Bruhaker

Attachment: Stipulations

## LEASE STIPULATIONS

Five areas were found to be unsuitable for mining in the 1982 MFP Amendment. These were:

Criterion 3. - 1/2-mile of Montana Highway FAS 314 and a buffer zone of 100 feet on either side of the right-of-way for a total of 18 acres.

The exception could not be applied as a formal agreement to move the road does not exist at this time. An exception may be applied at a later date provided all parties involved agree on a relocation plan.

Criterion 15. - 51 acres of riparian habitat were identified as unsuitable because of the high wildlife use which occurs in this area. No exception was applied.

Also, 154 acres of sage grouse winter range and 413 acres of antelope winter range were identified but these areas were not found to be unsuitable if the following conditions are met: "A mitigation plan for the sage grouse and antelope wintering grounds will require any successful bidder to show, and the State of Montana to agree, that all or stipulated methods of mining will not have a significant long term impact on the area-wide species habitat. Reclamation and management of reclamation areas must also provide suitable post-mining habitat. This land would then be considered suitable for leasing and the mitigation plan would become a lease stipulation. If the State of Montana does not agree that reclamation and management of reclaimed lands would provide suitable post-mining habitat, the wintering grounds will be excluded as unsuitable prior to issuance of a lease. This mitigation does not preclude the Montana Department of State Lands from enforcing its selective denial and unsuitability process.

Criterion 19. - The BLM did not find any of the Squirrel Creek AVF to be unsuitable. As part of the CX Mine permit application process, DSL and OSM identified 87 acres in the EA area to be unsuitable for mining. No exception was applied to this area.

The AVF determination overlapped the riparian habitat delineation by 47 acres, so the actual acreage found unsuitable along the Squirrel Creek bottom was 91 acres. The location of these areas is shown on Map 3.

A total of 520 acres of the EA area must yet be surveyed for cultural resources and unsuitability criterion Number 7 applied before a mine plan can be approved.

Mitigative measures (avoidance, stabilization and protection or data recovery of cultural resource values) for all portions of the EA area will be implemented in the case of presence of National Register designated or eligible properties, prior to mine plan approval.

# ENVIRONMENTAL ASSESSMENT
# SQUIRREL CREEK NONCOMPETITIVE
# LEASE AREA

## PURPOSE AND NEED

On October 9, 1980, the "Northern Cheyenne Indian Exchange Legislation", (PL96-401) was passed. This act provided for the cancellation of certain coal leases within the Northern Cheyenne Indian Reservation and negotiation with parties holding such leases for noncompetitive leases or bidding rights for competitive leases for federal coal off the reservation. Consolidation Coal Company (Consol) and Chevron Resources Company (Chevron) were two of the parties affected by this legislation. Agreements were signed by both companies in December 1981 to exchange their reservation rights for coal leases of 130 million tons each in the Squirrel Creek area.

In addition to the exchange agreements, Chevron and Consol are equal partners in the proposed CX Ranch mine, which is located in the immediately adjacent area of the exchange agreements. The CX Ranch mine is in the permitting process by the Department of State Lands (DSL) and the Office of Surface Mining (OSM). Portions of Squirrel Creek in the CX Mine area have been declared an alluvial valley floor (AVF) by DSL, which resulted in a denial to mine portions of the companies' fee and federal coal leases. Under section 510 of the Surface Mining Control and Reclamation Act (SMCRA, PL 95-87) the Secretary of the Interior may enter into an exchange agreement for leased federal coal and must exchange federal coal for fee coal that is precluded from being mined because of an AVF determination. This exchange shall be made under section 206 of the Federal Land Policy and Management Act of 1976 (FLPMA).

Because the decision to lease or exchange is made by the two laws cited (PL 95-87 and PL 96-401), the Secretary of the Interior has no discretion in considering issue or exchange of coal leases. He is further constrained by the cancellation agreements between the Northern Cheyenne, the Department of the Interior and the companies in that certain areas are identified for lease to meet the tonnage figures agreed upon. There is discretion allowed though in where the AVF exchange could occur. Thus, the alternatives that can be addressed in this environmental assessment (EA) are limited to three possibilities: the proposed action, the proposed action with an AVF exchange somewhere other than Squirrel Creek and the no action or no leasing, as described in Chapter 1.

## PROPOSED ACTION

The proposed action is to noncompetitively lease 130 million tons of coal each to Chevron and Consol as stipulated in the cancellation agreements. In addition, there will be an exchange of a yet undetermined amount of federal coal to replace the fee and possibly the federal coal found unsuitable because of the AVF determination. This is in accord with the decision for the Squirrel

Creek area made in the Powder River Resource Area Management Framework Plan (MFP) Amendment adopted July 13, 1982. The entire area of indicated interest by Chevron and Consol is being covered by this EA for administrative efficiency. Most likely, less area than is being addressed will be leased and the resultant impacts will also be less. If the leases for the Northern Cheyenne Exchange and the AVF exchange are issued with a large time gap, the EA will be updated to reflect any pertinent changes.

LOCATION

The Squirrel Creek area is located just north of the Wyoming state border in Bighorn County, Montana. Decker, Montana, is immediately adjacent to the area and Sheridan, Wyoming, is about 20 miles to the south.

# CHAPTER I

# ALTERNATIVES

## A. LEASE AND/OR EXCHANGE

This alternative is to issue noncompetitive leases to Consol and Chevron as required by PL96-401 and to exchange certain coal lands as required by PL95-87. These leases and fee (private) coal ownership would be adjacent to the proposed CX Ranch mine. For this environmental analysis, it is assumed the proposed mine would extend into the areas to be leased and that the entire area would eventually be mined. Specific characteristics of the tract follow.

### Location and Legal Description

See location Maps 1 and 2 and Table I-1.

### Acreage

| | Federal | State | Fee (Private) | Total |
|---|---|---|---|---|
| Surface | 481 | 0 | 3,365 | 3,846 |
| Coal | 3,846 | | 0 | 3,8463 |

### Coal Reserve/Millions of Tons

| | Federal | State | Fee | Total |
|---|---|---|---|---|
| In Place | 536 | 0 | 0 | 536 |

Recoverable*

*--To be determined by Minerals Management Service

### Type of Mine

The CX Ranch Mine (Squirrel Creek) is to be a truck and shovel operation designed to recover multiple coal seams.

### Production Rate

8,000,000 tons per year once full production capability is reached.

### Anticipated End Use

Export shipment for electrical generation.

### Surface Disturbance/Acres

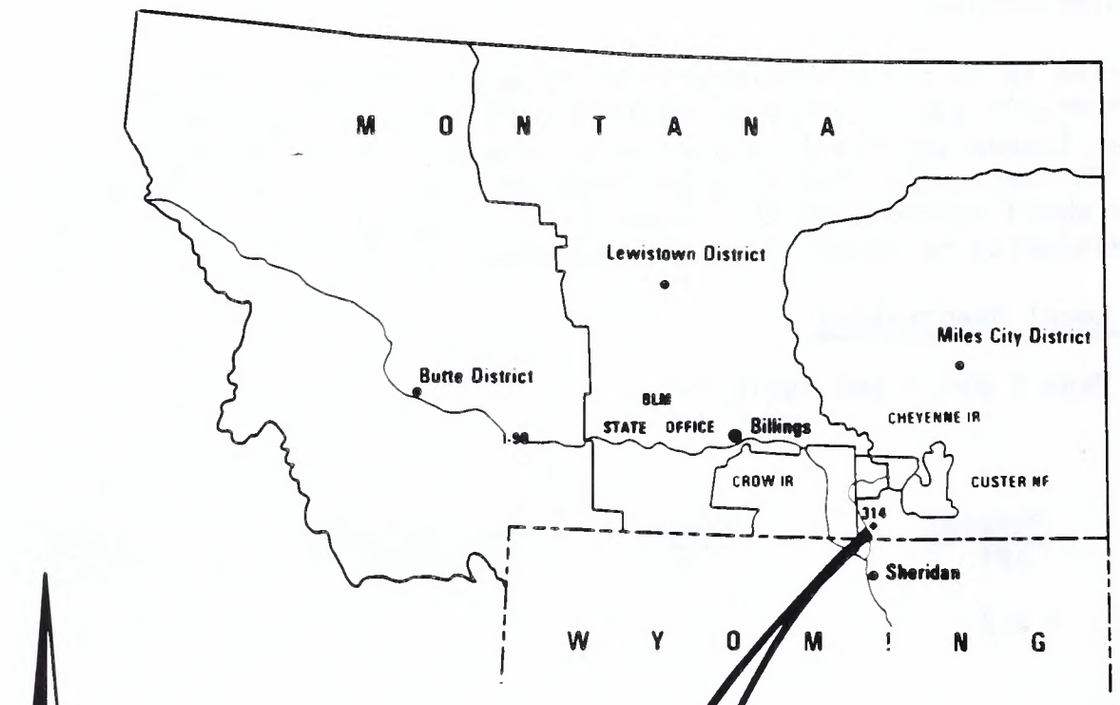
In this worst case alternative, it is assumed the entire 3,846 acres being addressed will be mined or surface disturbed.

### Stripping Ratio

5 to 1

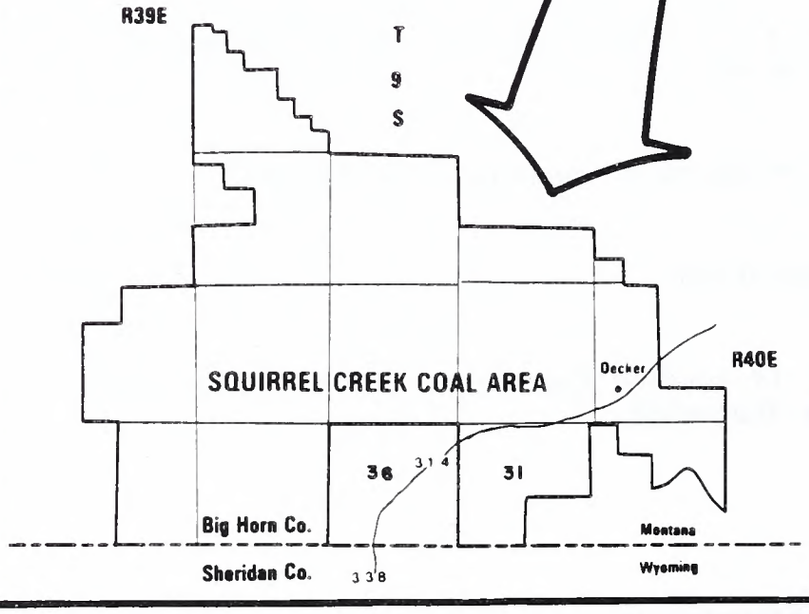
### Coal Thickness/Feet

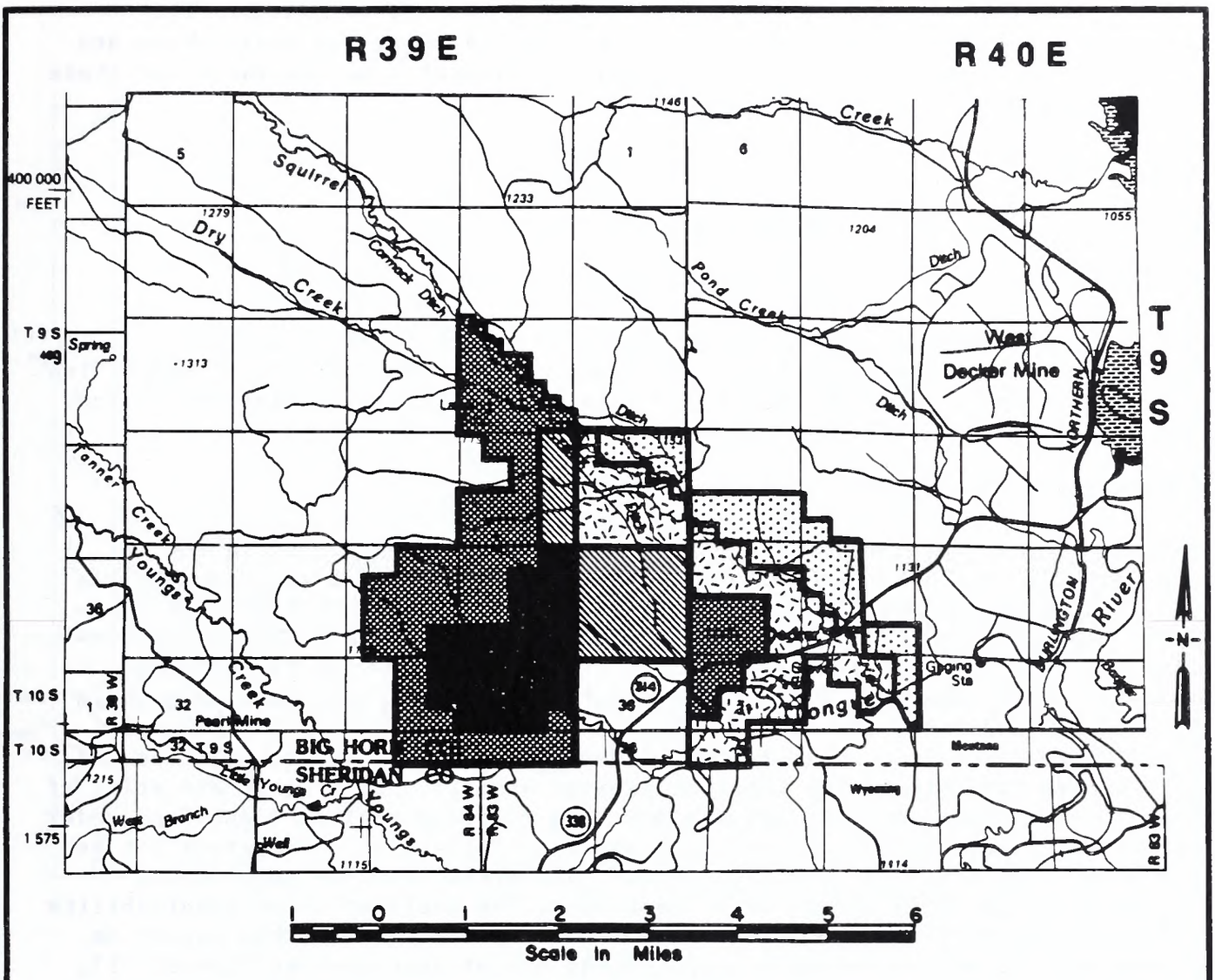
Depending on the number of seams occurring in any one location, up to 80 feet of coal are present. The top two seams, Smith and Roland, are considered





# GENERAL LOCATION MAP






# SQUIRREL CREEK COAL AREA

## LEGEND

- Consol Federal & Fee Coal Under Lease
- Federal Coal Consol Wants From Northern Cheyenne Legislation
- Federal Coal Chevron Wants From Northern Cheyenne Legislation
- Federal Coal of Interest to Consol & Chevron (AVF Exchange & Unsuitability)
- P.K.S. Federal & Fee Coal Under Lease (Proposed Wolf Mountain Mine)

probably unmarketable because of low quality. Minerals Management Service will have to make a determination at mine plan submittal if this coal will have to be taken or spoiled. If taken, it will probably have to be blended with better coal to be saleable. The Canyon seam may be too deep to be economically recovered. This leaves the Anderson, Dietz One and Dietz Two seams which are up to 80 feet thick where they are merged. Individual seam thickness for these three seams runs from 25 to 35 feet.

Water Needs

| | | |
|---|---|---|
| Potable* | 134,000 | gallons/per day |
| Non Potable | 350,000 | gallons/per day |

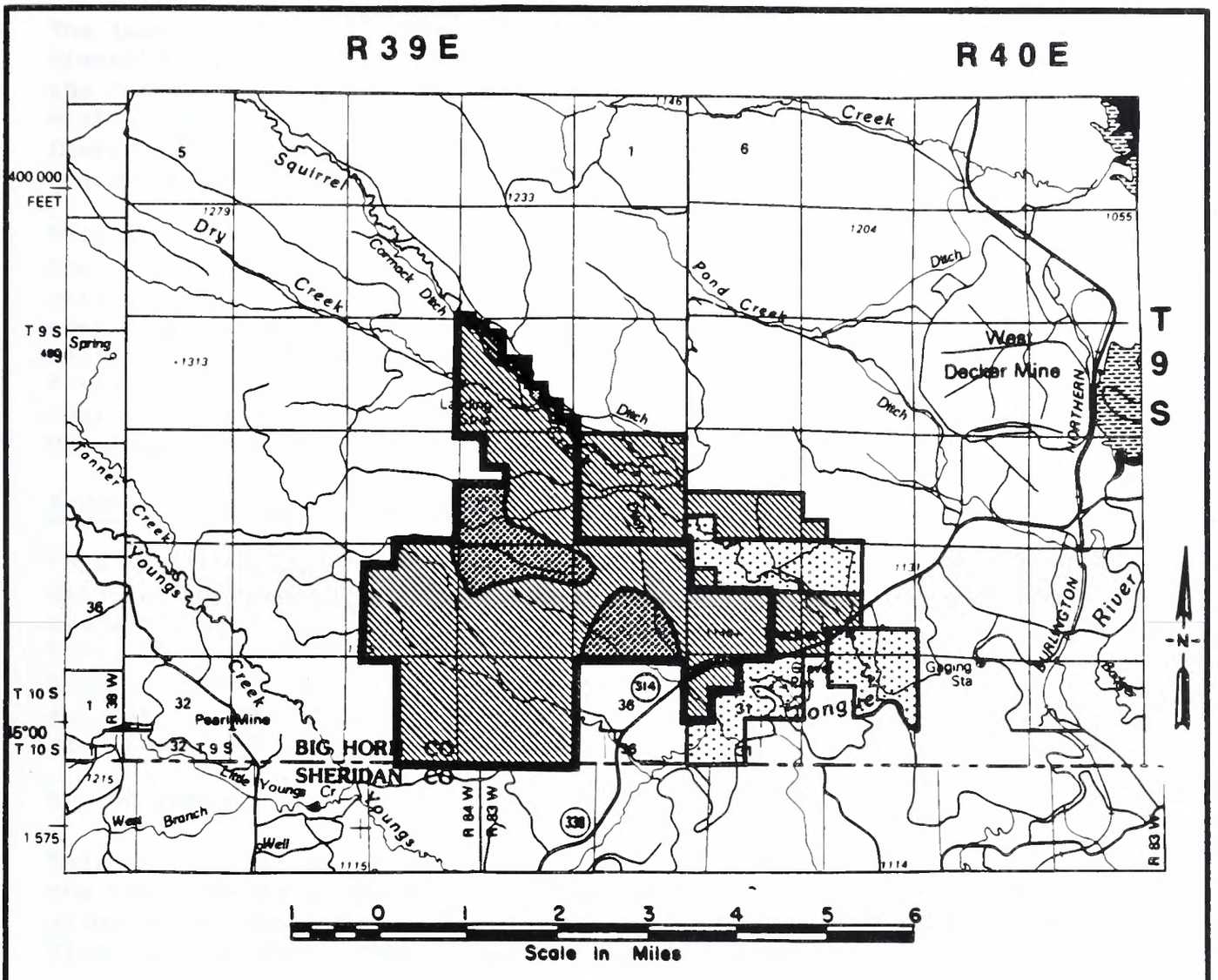
*Anticipated reserves needed. Actual use will be considerably lower.
Facts and figures presented here were drawn mainly from Consol's CX Ranch Mine Plan submission. This mine plan is on file in the Miles City District Office and can be reviewed for further background information.

RELATIONSHIP TO LAND USE PLANNING

Federal coal within the Squirrel Creek area was first addressed in the Decker-Birney MFP completed in 1975. The area was found not to be acceptable for leasing in the original planning. With the passage of PL96-401 and the subsequent signing of the exchange agreement between Consol, Chevron and the Department of the Interior, the BLM was directed to reassess the original planning. This reassessment was accomplished in the MFP Amendment adopted in July of 1982. Some of the multiple use concerns identified in the original planning were still found to be valid. See Map 3. Specifically, antelope and sage grouse habitat and the riparian habitat along Squirrel Creek are still of high value to area wildlife populations. The riparian habitat identified under criterion 15 fell within the AVF delineated by DSL and will therefore not be disturbed. One antelope wintering ground (414 acres) and one sage grouse wintering ground (154 acres) were identified. The application of unsuitability criterion number 15 did not find these areas unsuitable, but they cannot be leased without meeting certain stipulations for mitigation (See Chapter III, paragraph L). Criterion 19, Alluvial Valley Floors, was designated by DSL as part of the mine plan submission. Criterion 3 identified one-half mile of road right-of-way unsuitable. A total of 520 acres must be surveyed for cultural resources before mine plan approval. No other unsuitability criteria were found to apply and no other overriding multiple use conflicts were identified. The application of surface owner consultation found no qualified surface owners to be present. The surface in question is owned by Consol.

RELATIONSHIP TO OTHER DEVELOPMENTS

The surface area being considered by this EA is currently used for grazing. Hay to support winter feeding operations is grown along the Squirrel Creek bottoms. Several other coal mines exist or are proposed for the Decker vicinity. Mines in operation include East Decker, West Decker and Spring Creek. North Decker received a mining permit in August 1982. The proposed Wolf Mountain mine and adjacent proposed CX Ranch mine are in the permit application phase. Shell Oil Company is also planning a mine on the nearby Crow Indian Reservation.




# SQUIRREL CREEK COAL AREA

## STATUS OF COAL

## LEGEND

- Unsuitable for Mining
- Federal Coal Acceptable
- Federal Coal Acceptable With Stipulation
- Private Minerals Within EA Area

TABLE I-1

LEGAL DESCRIPTION AND ACREAGE OF FEDERAL COAL TO BE CONSIDERED FOR NONCOMPETITIVE LEASE OR EXCHANGE

| Legal Description | Surface Acres Public | Surface Acres Private | Total Acreage |
|---|---|---|---|
| T9S R39E | | | |
| Sec. 14 | | 370 | 370 |
| 23 | 160 | 360 | 520 |
| 25 | | 644 | 644 |
| 26 | 200 | 440 | 640 |
| 27 | 40 | 400 | 440 |
| 34 | 27 | 266 | 293 |
| 35 | 54 | 533 | 587 |
| T9S R40E | | | |
| Sec. 30 | — | 236 | 236 |
| 31 | — | 116 | 116 |
| Totals | 481 | 3,365 | 3,846 |

LEASING AUTHORITY

The leasing and/or exchange of federal coal for mining is governed by: the Minerals Leasing Act of 1920; the Federal Coal Leasing Amendments Act of 1976; the Federal Land Policy and Management Act of 1976 (FLPMA); and the Surface Mining Control and Reclamation Act of 1977 (SMCRA). In addition, the Northern Cheyenne Exchange Legislation of 1980 directs the coal to be leased noncompetitively.

This alternative assumes that if mining occurs, it would be an extension of the proposed CX Ranch mine currently in the permitting process. To obtain a permit, Consol must comply with existing state and federal regulations governing mining and reclamation. These include: Office of Surface Mining Reclamation and Enforcement regulations (30 CFR 700-899), Environmental Protection Agency regulations (40 CFR 0-1399), Council of Environmental Quality regulations (40 CFR 211), and Department of the Interior's Coal Management Program regulations (43 CFR 23 and 3400).

Further Environmental Assessment

This EA will allow the BLM to comply with the intent of the Northern Cheyenne Exchange Legislation and with the intent of SMCRA governing AVF exchanges. The noncompetively leased coal will not be counted as part of the target for the 1984 Powder River Coal lease sale because it is outside the normal coal program. Before mining can begin, a permit to mine must be obtained from DSL and OSM. An environmental impact statement will be prepared by these two agencies at the time of permit application.

B. NO ACTION

This alternative would not allow issuance of noncompetitive leases to satisfy the requirements of the Northern Cheyenne Exchange Legislation and would not allow an exchange of coal found to be unsuitable because of an alluvial valley floor determination. This is not a feasible alternative because of:

1) The existence of the Northern Cheyenne Exchange Legislation (PL96-401) which directs the Department of the Interior to noncompetitively lease agreed upon tracts to satisfy the requirements of the law.

2) The two companies, Chevron and Consol, signed agreements with the Department of Interior in December 1981 to exchange their lease rights on the Northern Cheyenne reservation for leases in the Squirrel Creek area.

3) The Surface Mining Control and Reclamation Act (PL95-87) which requires that fee coal found unsuitable because of an AVF determination must be exchanged for other federal coal.

C. EXCHANGE IN ANOTHER LOCATION

The Secretary of the Interior has the discretion to exchange federal coal for federal coal found unsuitable because of an AVF determination. He does have discretion as to where that exchange coal would be offered. However, since the coal Chevron and Consol have asked for is contiguous to a proposed mine in the

permit and EIS stage, impacts would be less than offering exchange coal in an area not presently being developed. Such an exchange elsewhere could also make it unfeasible to mine the coal both in the proposed area and in a new area.

## CHAPTER II
## AFFECTED ENVIRONMENT

### A. TOPOGRAPHY

The area of interest consists primarily of rolling to steeply rolling terrain. It is interspersed with major stream drainages, the major flow axes being to the southeast. The smaller side drainage axes tend to be at right angles to the southeast. This rolling to steeply rolling country ranges in elevation from about 3600 to 3880 feet.

In the central and west central tract portions above 3880 feet, the terrain basically is flat tablelands.

### B. GEOLOGY

This area is within the Sheridan coal field of the Powder River Basin. Geologically the surface rocks exposed from the Roland coal seam and below are those of the upper part of the Tongue River Member of the Fort Union Formation. They are upper Paleocene in age. The rocks consist of interbedded sandstones, siltstones, shales, some scoria, and coal beds.

The rocks exposed above the Roland coal seam are within the Wasatch Formation of Eocene age. This formation consists of a sequence of interbedded claystone, shales, siltstones, and sandstones.

Two faults cut through the project area. The strike of both faults is about N60E in the project area. For both faults, the downthrown side is to the southeast.

### C. MINERALS

The six major coal seams present within the 500-foot recovery line are: Roland, Smith, Anderson, Dietz 1 (D1), Dietz 2 (D2), and Canyon.

The various seam thicknesses in feet are:

| | |
|---|---|
| Roland: | 8-12 |
| Smith: | 8-14 |
| Anderson + Dietz 1 and 2: | 75-85 |
| Canyon: | 17-20 |

Coal quality on an as received basis by seams is:

| | Roland | Smith | Anderson+D1+D2 | Canyon |
|---|---|---|---|---|
| Percent moisture | 29.51 | 26.92 | 20.83 | 23.22 |
| Percent ash | 4.05 | 6.01 | 4.28 | 5.30 |
| Percent sulfur | 0.37 | 0.72 | 0.37 | 0.40 |
| BTU's/lb | 8,304 | 8,581 | 9,636 | 9,370 |

The above figures are averaged. All these coals are subbituminous in ranking.

TABLE II-1
MILLION TONS COAL BY SEAM

| T9S R39E (Acres) | Roland | Smith | Anderson +D1 & D2 | Canyon | Surface Acres Public/Private |
|---|---|---|---|---|---|
| Sec. 14 (370) | — | 2.2 | 53.5 | 10.2 | — / 370 |
| 23 (520) | 0.1 | 7.9 | 68.7 | 3.9 | 160 / 360 |
| 25 (644) | — | 2.9 | 87.4 | 16.5 | — / 644 |
| 26 (640) | 1.9 | 4.4 | 68.5 | 6.3 | 200 / 440 |
| 27 (440) | 2.1 | 7.6 | 33.6 | — | 40 / 400 |
| 34 (293) | — | 4.5 | 22.2 | 0.5 | 27 / 266 |
| 35 (587) | — | 5.0 | 59.0 | 9.1 | 54 / 533 |
| T9S R40E | | | | | |
| Sec. 30 (236) | — | 4.1 | 31.6 | 3.9 | — / 236 |
| 31 (116) | — | 0.3 | 16.5 | 2.0 | — / 116 |
| TOTALS (ACRES) 3,846 | 4.1 | 38.9 | 441.0 | 52.4 | 481 /3,365 |

Grand Total 536.4 Million Tons

For coal tonnages by seam calculated to the 500-foot recovery line, see Table II-1. A value of 1,760 tons of coal per acre foot was used in the calculations. Within this project area, the federal mineral ownership is 1,925 acres of coal only and 1,921 acres of all minerals. The two mineral estates are intermixed to a great extent.

A check for mining claims indicates none within the area as of June 1982.

A check of the Montana Oil and Gas Commission information for January 1982 indicates no oil and/or gas wells have been drilled within the area.

The major mineral impact would be on the scoria present. Most scoria is associated with the Roland seam. An estimated 470 acres of this scoria is federal. An estimated 160 acres is private. The Smith seam has about 30 acres of associated scoria.

Some scoria may be used as road material. The Roland scoria is too high above the seams to be of major economic interest. Due to topography and interburden of about 450-500 feet between the Roland and Anderson seams, strip mining would disturb little, if any, Roland scoria.

D. PALEONTOLOGY

Fossil plant remains can be found throughout the coal bearing rocks. Fossil shells can also be found at various places within these rocks. Petrified wood has been found in association with some coal seams. However, no valuable paleontological resources are known to exist within the area.

E. SOILS

Soils are composed of deep, loamy (Ft. Collins, Haverson) or clayey (Lohmiller, Heldt), calcareous alluvial soils, on nearly level to gently sloping (2 to 8% slopes) fans, footslopes and terraces; moderately deep, sandy, calcareous soils (Nelson) over softly consolidated sandstones on gently and strongly sloping (4-15%) slopes; and shallow thin surface clayey (Midway), calcareous soils over softly consolidated clay shale on hilly to steep (15-45% slopes) sideslopes, ridges and knolls.

Many soil mapping units occur as complex variable patterns of deep soils, shallow soils and rock outcrop areas of no soil throughout the coal area and are evaluated as shallow soil units.

The soils data is from an order II detail published soil survey for Big Horn County.

F. HYDROLOGY

1. Surface Water

This area is drained mainly by Squirrel Creek and its tributaries. Squirrel Creek is a perennial flow that discharges into the Tongue River It passes directly through only a small portion of this area. All other streams either feed Squirrel Creek or pass directly into the Tongue River and are ephemeral.

Squirrel Creek flow rates are quite variable. High flows occur in late winter and early spring due to snowmelt, which is often supplemented by rainfall. In late summer, evapotranspiration is high but precipitation events are infrequent. Consequently flows are lowest until snowmelt occurs again. Stream discharge during low flow is maintained by ground water contributions, which derive mostly from springs in the headwaters area. Recharge to alluvium probably occurs from high flow in Squirrel Creek and lateral flow from bed rock aquifers adjacent to alluvium. Due to high evaporation rates in the area and high potential consumptive use potential vertical recharge to alluvium by precipitation is extremely low.

Average annual runoff is somewhat higher for the Squirrel Creek drainage than for adjacent drainages due to its relatively deep incision into the ground-water system, the large number of springs in the headwaters areas and eastward drainage. Ferreira (1981) reported average annual runoff fo years 1968-77 to be 3.96 inches. This runoff results in relatively high maximum flows. Consolidation Coal Company reported the maximum flow for water years 1976-78 as being 584 cubic feet per second (cfs) and low flows as being less than or equal to 1 cfs. Van Voast (1981) reported a median flow (flow that may be equaled or exceeded 50% of the time) of 1. cfs for water years 1976-79.

Squirrel Creek was characterized by Van Voast (1981) as a losing stream from T9S R38E, Section 1, down to the southeast quarter of Section 14, T9S R39E. Below this point it is a gaining stream. That is, the stream is closely connected to alluvial groundwater and is either gaining water or losing water to it. The boundary between the change is demonstrated by an abrupt change in water quality. The upper reach contained magnesium-bicarbonate and magnesium-bicarbonate-sulfate type waters with dissolved-solids concentrations ranging from 584 milligrams per liter (mg/l) to 950 mg/L. The downstream reach shows higher concentrations of dissolved solids with a range from 1,970 mg/L to 3,844 mg/L. These elevated concentrations are mainly from increased levels of sodium, magnesium, and sulfate with an increase in chloride and nitrate also considered significant. Trace element concentrations that increase are lead, lithium, nickel, strontium and tin. While Van Voast (1981) attributes this water quality degradation to contributions by ground water, both the Wolf Mountain and CX Ranch mine plans credit irrigation return flows as the major contributor. Kiewit Mining and Engineering Company combined water quality readings from seven Squirrel Creek sampling sites and reported a total combined mean for total dissolved solids (TDS) of 2,468 mg/L, which compares to 383 mg/L for the Tongue River.

Water use is governed, to a large degree, by water quality. At least four small stock reservoirs collect suitable water for livestock and wildlife from ephemeral drainages. Ephemeral drainage water TDS content was reported to range from 1200-2500 mg/L by Consol. Squirrel Creek water in the losing portion of the stream is good for irrigation and is used to irrigate approximately 260 acres of alfalfa along the drainage. Irrigation only takes place during spring runoff when streamflow is great enough to be diverted. During this period primary federal drinking water standards are met and secondary standards are exceeded (CONSOL-CX Ranch Mine Plan). In addition, the main stem of Squirrel Creek is used in a limited capacity for lawn and garden watering at the CX Ranch headquarters. Tongue River water quality is among the best in the area, is adequate for most uses, and is used extensively for irrigation.

2. Ground Water

The Thompson, Van Voast MBMG 1981 report #84 characterizes aquifers in the area as follows:

Ground water in the Squirrel Creek area is found naturally in three differentiable but interrelated aquifers: the alluvium of the Squirrel Creek and Tongue River valleys, the clastic rocks of the Tongue River Member, and the shallow coal beds found in the Tongue River Member. Ground water has also infiltrated reclaimed mine spoils at the Decker mine, and has produced a man-made aquifer comprising the saturated basal portion of the spoils.

The Squirrel Creek valley contains up to 60 feet of alluvial material. In general, the alluvium consists of a basal lens of gravel 25 to 35 feet thick at its center, covered by another 10 to 30 feet of sand, silt, and clay. Ground water has saturated most of the alluvium below stream level, but most of the flow takes place in the more permeable gravel section. The quality of the ground water found in the alluvial aquifers precludes domestic use without treatment, although it is suitable for stock and marginally suitable for irrigation use. Because of their lateral and vertical discontinuity, the siltstones and fine-grained sandstones of the Tongue River Member form aquifers of limited worth. Some wells produce stock water from these shallow clastic rocks. Well yields are generally less than a few gallons per minute and water quality is normally low.

The Anderson and Dietz seams yield significant quantities of potable water and are the most important aquifers in the area. They meet domestic needs for many residents, as well as providing water for stock use. They are also the aquifers most strongly affected by mining. Yields of wells producing water from coal beds are generally less than 10 gallons.

Squirrel Creek area hydraulic conductivities for coal beds are statistically higher when comparing coal beds in southeastern Montana. Conductivities for overburden have a broader but lower range. Alluvial transmissivities range from about 1350 $ft^2$/day to 11,400 $ft^2$/day and coal transmissivities from about 3 $ft^2$/day to almost 500 $ft^2$/day.

Recharge to alluvium has been discussed some already. In addition, on the west side of Squirrel Creek, ground water discharges from consolidated sediments to alluvium and that alluvium recharges consolidated materials on the southeast side of the creek.

Most recharge for coal occurs in structurally high areas of clinker alon Youngs Creek and west of there. Drainage occurs naturally along burned outcrops and subcrops near the Tongue River and other structurally low drainages.

Regional structural dip is southeastward and is the preferred direction of ground water flow, if it were not for the barrier effects of faults in the area. Northeast trending faults strongly control direction of ground water movement to coincide with the fault strike. MBMG Report 84 shows three maior fault blocks transversing northeastward across the area, which governs the direction of potentiometric contours. Flow in each block seems isolated from flow in adjacent blocks.

Ground water quality for the area is summarized by MBMG 84 report as follows:

Ground water in alluvium along Squirrel Creek is highly mineralized relative to most other waters of the area; dissolved-solids concentrations range from 1,342 to 6,060 mg/L. Principal constituents are magenesium, sodium, and sulfate, and as with Squirrel Creek low flow described earlier, their concentrations increase in the downstream direction without corresponding increases of calcium and bicarbonate. Because it is highly mineralized, water in the alluvium is not used for domestic supply. Rather, ranchers choose to bypass the alluvium to reach deeper, more potable water. Although some subirrigation is apparent along Squirrel Creek, water in the alluvium presents a very high salinity hazard for irrigation use according to criteria by Wilcox (1955).

In ground waters from the Fort Union clastic beds, sodium was found to be the strongly predominant cation, and sulfate and bicarbonate were the principal anions. The water is generally too highly mineralized for either human consumption or irrigation use; dissolved solids content range d from 2,430 to 7,360 mg/L in the five samples analyzed.

The coal aquifers in the Squirrel Creek area contain waters in which sodium is the strongly predominant cation. In most samples, bicarbonate was the predominant anion; substantial concentrations of sulfate were found in only a few. Dissolved-solids concentrations in the coal waters ranged from 686 to 2,851 mg/L and averaged 1,610 mg/L. Most waters are judged unsuitable for irrigation use because of their very high sodium concentrations and moderate to high salinity levels. Most also fail to meet recommended standards for drinking water (U.S. Environmental Protection Agency, 1975) because of high

dissolved solids contents. In most places other than the Northern Great Plains, ground water of this quality would not be considered desirable. In the Squirrel Creek area an surrounding region, however, waters in the coal beds have the highest quality and are regularly used for domestic and livestock supplies by area residents, apparently with no harmful effects.

Trace elements were detected in all ground-water samples analyzed. None were found in alarmingly high concentrations. The concentration of selenium in one analysis of water from clinker, 13.7 mg/L, did exceed th U.S. Public Health Service (1962) mandatory limit of 10 mg/L for public water supplies, however, and most concentrations of manganese in waters from alluvium and overburden exceeded the recommended limit of .05 mg/L. Some relationships between trace-element concentrations and the source waters are evident. Lithium concentrations in water from alluvium increase in the downstream direction, almost identically to those found in Squirrel Creek low flow. Lithium concentrations in waters from overburden are much higher than those in other waters, probably reflecting a geochemical association with clays. Concentrations of most trace elements in coal-bed waters are less than those in other waters, and are relatively uniform, suggesting relatively stable geochemical conditions.

G. LAND USE

1. Vegetation

The Squirrel Creek EA area consists of approximately 3,846 surface acres. Of that, 3,543 surface acres (92.12%) of the area are rangeland. The balance of 303 acres (7.88%) is cropland. The rangeland consists of four dominant range sites. These range sites are clayey, 609 acres (17%), shallow-silty 1,419 acres (40%), silty 283 acres (8%), silty-shallow 762 acres (22%). Other range site complexes total 470 acres (13%). Within these range sites, there are varying production yields (pounds per acres) and condition classification. The clayey range site produces approximately 154 AUMs (21%), shallow-silty 268 AUMs (36%), silty 71 AUMs (10%), silty-shallow 173 AUMs (23%) and other range site complexes 78 AUMs (10%). There are approximately 744 AUMs being produced per year on the area in its present condition.

2. Agriculture

There are approximately 3,846 surface acres of land overlying public coal in the Squirrel Creek EA area. About 24.78 percent (953 acres) of the area is suitable for agricultural cropland use (Class III through IV land). Only 7.88 percent (303 acres) is currently being utilized as cropland. See Table II-2. The balance of the land is class VI through VIII , which is only suitable for rangeland.

Agricultural operations in the area are mainly livestock with small area of hay (alfalfa or grass-legume), small grains and tame pasture (see Agricultural

Land Use Table). Hay or small grains are mainly grown for livestock feed during the winter months. Some small grains are grown to sell.

This area currently has a total of 15 acres of class III and IV land (.0039 percent of the area) in hay, which produce approximately 13 tons per year under dryland conditions. About 15 acres could be or are irrigated, which would produce an additional 58 tons of hay per year.

Currently 166 acres of class III and IV land (4.32 percent of the area) are planted to wheat or barley, which produce approximately 3,726 bushel of wheat or 5,892 bushels of barley per year under dryland conditions. There are about 146 acres which could be or are irrigated that could produce an additional 4,075 bushels of wheat or 4,487 bushels of barley per year.

Approximately 122 acres of class III and IV land (3.17 percent of the area) are in tame pasture, which will provide approximately 119 AUMs per year under dryland conditions. About 15 acres of this land could be or are irrigated and would provide an additional 121 AUMs.

In addition, there are approximately 650 acres of Class III and IV land (16.90 percent of the area) that are not presently cropped, but are suitable for cropland. This land could produce approximately 545 tons of hay or 11,509 bushels of wheat under dryland farming operations. Of that amount there are 528 acres which could be irrigated and yield an additional 1,898 tons of alfalfa hay or 14,162 bushels of wheat. This land is currently being utilized as rangeland.

3. Recreation

The area does not have public recreational opportunities, although excellent hunting potential does exist. All hunting on the CX Ranch is privately controlled, because the road leading to the proposed mining area and the surrounding surface is privately owned.

4. Effects on Indian Tribes

Mining in this area should not have any major effect upon either the Crow or Northern Cheyenne Indian Reservations. The Northern Cheyenne Reservation is located over 20 miles from the proposed mining area and the Crow Reservation is approximately 10 miles away, but neither has adequate transportation systems leading to the area. Therefore, these reservations should not receive additional vehicular traffic due to mining activities.

5. Transportation and Access

Access to the area is provided by a private road intersecting Montana Highway 314 about one mile north of the Montana-Wyoming border. Approximately fifteen miles south of the proposed CX mine lies U.S. Interstate 90. Also, Montana State Highway 314 passes through part of the EA area. The latter is a paved

TABLE II-2

AGRICULTURAL LAND USE TABLE

| PRESENT USE OF LAND 1/ | ACRES | % OF AREA | LAND CLASS 2/ CAPABILITY NON-IRRIGATED | LAND CLASS 2/ CAPABILITY IRRIGATED | PREDICTED AVERAGE YIELDS 1/ WHEAT DRY LAND (BU) | WHEAT IRRIGATED (BU) | BARLEY DRY LAND (BU) | BARLEY IRRIGATED (BU) | OATS DRY LAND (BU) | OATS IRRIGATED (BU) | ALFALFA DRY LAND (TON) | ALFALFA IRRIGATED (TONS) | TAME HAY DRY LAND (TONS) | PASTURE DRY LAND (AUMS) | PASTURE IRRIGATED (AUMS) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cropped (small grain) | 96 | 2.50 | III | II | 2,352 | 5,077 | 3,654 | 6,904 | 3,009 | 8,698 | 86 | 484 | 80 | 86 | 1,064 |
| Cropped (small grain) | 50 | 1.30 | III | III | 1,074 | 2,424 | 1,798 | 3,035 | -- | 2,664 | 52 | 225 | 35 | 41 | 550 |
| Cropped (small grain) | 20 | 0.52 | IV | -- | 300 | -- | 440 | -- | -- | -- | -- | -- | -- | 18 | -- |
| TOTAL small grains | 166 | 4.32 | | | 3,726 | 7,501 | 5,892 | 9,939 | 3,009 | 11,362 | 138 | 709 | 115 | 145 | 1,614 |
| | | | | | | | | | | | | | | | |
| Alfalfa or grass - | | | | | | | | | | | | | | | |
| Legume hay | 6 | 0.16 | III | II | 138 | 312 | 210 | 444 | 300 | 558 | 5 | 30 | 5 | 5 | 66 |
| Legume hay | 9 | 0.23 | III | III | 180 | 423 | 297 | 513 | -- | -- | 8 | 41 | 6 | 8 | 99 |
| TOTAL (alfalfa or grass legume hay) | 15 | 0.39 | | | 318 | 735 | 507 | 957 | 300 | 558 | 13 | 71 | 11 | 13 | 165 |
| | | | | | | | | | | | | | | | |
| Tame pasture | 15 | 0.39 | III | III | 300 | 765 | 495 | 930 | 750 | 1,275 | 14 | 68 | 11 | 14 | 135 |
| Tame pasture | 23 | 0.60 | III | -- | 458 | -- | 839 | -- | -- | -- | 2 | -- | 17 | 18 | -- |
| Tame pasture | 84 | 2.18 | IV | -- | 36 | -- | 57 | -- | -- | -- | 19 | -- | 17 | 87 | -- |
| TOTAL pasture | 122 | 3.17 | | | 794 | 765 | 1,391 | 930 | 750 | 1,275 | 35 | 68 | 45 | 119 | 135 |
| | | | | | | | | | | | | | | | |
| TOTAL cropped acres | 303 | 7.88 | | | 4,838 | 9,001 | 7,790 | 11,826 | 4,059 | 13,195 | 186 | 848 | 171 | 277 | 1,914 |
| | | | | | | | | | | | | | | | |
| Non-cropped range | 63 | 1.64 | III | II | 1,458 | 3,065 | 2,151 | 4,289 | 52 | 4,939 | 60 | 284 | 50 | 50 | 632 |
| Non-cropped range | 465 | 12.09 | III | III | 9,306 | 21,861 | 15,357 | 26,520 | -- | 216 | 419 | 2,093 | 326 | 418 | 5,115 |
| Non-cropped range | 35 | 0.91 | III | -- | 673 | -- | 1,133 | -- | -- | -- | 24 | -- | 6 | 28 | -- |
| Non-cropped range | 87 | 2.26 | IV | -- | 72 | -- | 107 | -- | -- | -- | 42 | -- | 33 | 74 | -- |
| TOTAL range | 650 | 16.90 | | | 11,509 | 24,926 | 18,748 | 30,809 | 52 | 5,155 | 545 | 2,377 | 415 | 570 | 5,747 |

1/ Cropland, land suitable for cropland and average predicted crop yields derived from published Big Horn County soil survey, December, 1977, Soil Conservation Service and Bureau of Indian Affairs and data from Agricultural Stabilization and Conservation Service, Big Horn County.

2/ Land class capability is derived from published Big Horn County soil survey, December, 1977, Soil Conservation Service and Bureau of Indian Affairs.

two lane all-weather highway going south 17 miles (becoming Wyoming State Highway 339) to Sheridan, Wyoming.

Within one-half mile of the CX Ranch is a Burlington Northern spur line which terminates at the West Decker Mine. Also, two other mining companies have proposed construction of spurs to nearby mine sites. These two would pass near the proposed mine site. Consol has also proposed to construct a railway spur which would go south from the West Decker mine to Consol's loading zone.

6. Rights-of-Way

Rights-of-way from federal land for telephone and power transmission lines, roads and railroad spur lines in the mining area will not be necessary because Consol owns the private surface within the EA area. Currently, Consol is in the process of obtaining approval from the Montana Department of Highways for the construction of an aerial conveyor across Montana Highway FAS 314. This conveyor would transport coal across the highway to the loading facility.

H. WILDLIFE

The Squirrel Creek area has been intensively studied for wildlife values since the mid 1970's. These studies included:

1) A baseline wildlife survey of the Shell Oil Pearl Area proposed lease by Westech (Farmer 1977, 1978)

2) A baseline wildlife survey of the Spring Creek area proposed lease by VTN (1977)

3) A baseline wildlife survey for the Decker Mining Complex and proposed mining areas incorporating data from the CX Ranch properties of Peter Kiewit & Sons' Company, Incorporated (PKS). These data include work done in conjunction with the Montana University System, the U.S. Fish and Wildlife Service (USFWS), Sheridan, Wyoming, office, and the Montana Department of Fish, Wildlife and Parks. PKS data also include results of two small mammal studies (ECI 1976; Renewable Resources Consulting Services, Ltd. 1978).

4) U.S. Fish and Wildlife Service studies including an inventory of raptor nesting sites and productivity, big game migration routes and distribution, and song bird concentrations (Amstrup 1976, 1977, 1978; Biggins 1976, 1977, 1978, 1979; Lockhart and McEneaney, 1978; Lockhart, McEneaney and Harting 1977). Other USFWS studies include sharp-tailed grouse and sage grouse lek surveys.

5) A baseline wildlife survey of the Shell Oil lease area conducted by the Montana Agricultural Experiment Station, (Coenenberg, et al 1979).

6) Montana Department of Fish, Wildlife and Parks surveys of big game and game bird distributions on several potential coal development areas (Knapp 1977).

7) The CX Ranch Environmental Base Evaluation (Olson-Elliott and Associates 1979).

Major wildlife habitats identified were sagebrush grassland, grassland, riparian and breaks (badlands). Physical features of importance to wildlife are cliffs and sandstone outcrops, which occur in the area.

A large variety of wildlife occur in the area because of the habitat diversity. Sage grouse and antelope utilize the sagebrush grassland complex year-long. An antelope wintering area of approximately 1,100 acres has been identified in and adjacent to the northwest portion of the area. Up to 385 antelope utilized this area during the severe winter of 1977-78. A sage grouse wintering area was also identified in the SW 1/4 of section 25, T9S, R39E. This dense sagebrush stand supported up to 25 sage grouse during the winter. One sage grouse strutting ground (lek) and an alternate lek were identified 1/2 mile west of the area. Females attending this lek probably nest in the EA area and utilize the Squirrel Creek bottom for brood rearing.

Mule deer use is primarily migratory in nature with winter being the time of highest use. Crucial mule deer wintering areas were identified on the steep slopes to the northeast of Squirrel Creek. No crucial use areas were identified on the EA area.

White-tailed deer use the riparian bottoms along Squirrel Creek on a limited basis. They tend to move back and forth to the Tongue River bottoms where the majority of use occurs. These same riparian bottoms support a large wildlife diversity. Ring-necked pheasants and several species of passerine birds occurred exclusively in the riparian bottom along Squirrel Creek (OEA Research 1981).

Some of the raptors which occur in the area include the golden eagle, prairie falcon, red-tailed hawk and great horned owl.

Two pairs of golden eagles nest in adjacent areas and utilize the EA area as part of their hunting territories. The sandstone outcrops provide nesting sites for the great horned owl in the EA area and the prairie falcon in an adjacent area.

Endangered species use of the area is quite limited. Bald eagles winter below the Tongue River Dam 10 miles to the northeast, as long as open water remains. Peregrine falcons migrate through the area but no nesting occurs. A few small prairie dog towns occur but no evidence of black-footed ferret use has been identified.

I. CULTURAL RESOURCES

The Squirrel Creek EA area has been inventoried in numerous surveys, with 3,285 of 3,845 acres inventoried to Class III levels (85%). Five hundred-sixty acres remain to be inventoried. Totals of 49 archaeological and historic

sites, eight minimal activity areas and 12 isolated artifact locations have been recorded in the area. The sites include: one bison kill, two rock art sites, one group of tipi rings, one rock shelter, one occupation complex, 36 lithic scatters and workshops, one cluster of wagon mines, and six historic structures and complexes.

Six of the above sites have been determined eligible for the National Register of Historic Places. These are:

24BH 1001 (Foss-Thomas Bison Kill)
24BH 1030 (Sandy Mesa Occupation)
24BH 1949 (Powers Tipi Rings)
24BH 1950 (Powers Petroglyph Shelter)
24BH 2091 (Campsite)
24BH 2125 (Powers Ranch Complex)

Eleven sites require further work to determine their eligibility to the National Register:

| | | |
|---|---|---|
| 24BH 1571 | 24BH 1951 | 24BH 2095 |
| 24BH 1580 | 24BH 1956 | 24BH 2100 |
| 24BH 1944 | 24BH 2093 | 24BH 2105 |
| 24BH 1947 | | 24BH 2103 |

The sites located in the Squirrel Creek EA area indicate human occupation dating from about 8000 years B.C., evidenced by Hell Gap and Agate Basin point fragments. The area was extensively used during the Late Plains Archaic and the Late Prehistoric periods. Historic development began about 1880, but no evidence of this period has been found in the Squirrel Creek area. Location of the site distribution is shown in following Table II-3.

J. VISUAL RESOURCE MANAGEMENT

The area has numerous sandstone ridges and outcrops which are common in this area. Upland plateaus are located between the drainages, with Squirrel Creek being the major drainage. The slopes of the ridges and drainages have Ponderosa pine and juniper, while the valleys and plateaus have a sagebrush-grassland type of biome. The Squirrel Creek riparian zone contains deciduous trees and shrubs. About one-half mile southeast of the CX Ranch landing strip exists an outcrop of sandstone eroded to resemble twenty-to-thirty foot chimneys. Very little of the study area is visible from any public road.

K. ECONOMIC AND SOCIAL CONDITIONS

The EA area being considered is sparsely populated and is located near the southern boundary of Big Horn County. The nearest town in Montana is the community of Decker (population 30). Cattle ranching is the predominant nonmining activity in the area.

Table II-3

DISTRIBUTION OF CULTURAL SITES AND FEATURES

| | Sites | Minimal Activity Areas | Isolated Artifacts |
|---|---|---|---|
| T9S, R39E: | | | |
| Sec. 14 | 5 | | 2 |
| Sec. 23 | 8 | 3 | |
| Sec. 24 | 10 | | |
| Sec. 25 | 3 | 4 | 1 |
| Sec. 26 | 6 | | |
| Sec. 27 | | | |
| Sec. 34 | 4 | | 1 |
| Sec. 35 | 4 | | 3 |
| T9S, R40E | | | |
| Sec. 19 | | | |
| Sec. 29 | 1 | | |
| Sec. 30 | 4 | 1 | 5 |
| Sec. 31 | 3 | | |
| Sec. 32 | 1 | | |
| Totals | 49 | 8 | 12 |

Several surveys over the past five years have shown, on a fairly consistent basis, that most residents are in favor of mineral development. The principal reasons for supporting development are national energy needs and economic growth of the area.

Development of this EA area will bring new population growth to Sheridan, Wyoming. Coal taxes would not be available to Sheridan to provide monetary assistance to develop this growth. All coal taxes would go to the State of Montana and Big Horn County. The city of Sheridan, as well as Sheridan County, would see an increase in trade and an increase in demand for housing as a result of new people coming into the area.

Sheridan County may need assistance for maintaining county roads that would be used by workers should the EA area be developed. The county roads and bridges in the area were designed as farm to market roads and were not developed for large numbers of vehicles or heavy loads. It may be to the benefit of the developing coal company to provide some assistance to the county to assist in providing safe and usable roads for their workers.

Only five percent of the workers are predicted to reside within Big Horn County should coal be developed. This could be increased to a maximum of twenty percent if a proposed housing development is completed at the new townsite of Spring Creek, Montana.

With new workers coming into the area, there are two characteristics of the likely population that can be predicted. First, they would be in the 19-35 year age range and, secondly, they would have quite different occupations than generally found in the region.

The younger aged population would also bring with it different lifestyles in some respects from those of the long-term residents. However, there is no reason to believe potential conflicts between lifestyles cannot be reconciled.

The Northern Cheyenne and Crow Indians can benefit from coal development as the potential for employment will increase. Training should be initiated to meet the needs of the mining company as development progresses.

Road traffic increases on the reservations would be dependent upon the number of Northern Cheyennes and Crows that are employed. Very little, if any, traffic through the reservations is expected should the EA be developed.

L. CLIMATE AND AIR QUALITY

1. Climate

This area, like most of southeastern Montana, is characterized by a semiarid continental steppe type of climate. Air masses cross the area from the Arctic, the Gulf of Mexico, and the Northern Pacific. The Rocky Mountains modify

prevailing westerly air masses from the Northern Pacific. No topographical barriers, however, exist to modify cold air masses from the north and warm, moist air masses from the south.

The area is in a region of climatic extremes, where temperatures vary widely on an annual, seasonal, and daily basis. Climatological data collected at Decker and the West Decker Mine, just a few miles northeast, since 1975 are indicative of this EA area. Average annual temperature is 45.7°F. July is the warmest month with a monthly mean temperature of 72.3°F. January, probably the coldest month, has a mean temperature of 13.4°F. Annually, temperatures equal or exceed 90°F about 40 days per year while zero and below temperatures occur about 35 days per year. Daily variations of 30° to 40°F are not uncommon. Large summer diurnal ranges occur due to low humidity, low daytime cloud cover, and high insolation. Outbreaks of cold air originating in Canada and rapid nighttime radiation cooling cause late spring and early fall freezes relatively frequently. Average growing season is 129 days for 32°F and 163 days for 28°F.

Average annual precipitation at West Decker is 13.71 inches. Sixty percent of average annual precipitation can be expected to fall from April through July. May-June precipitation is especially important from a reclamation standpoint. It is therefore fortunate for this area that 50% of the precipitation does occur during spring.

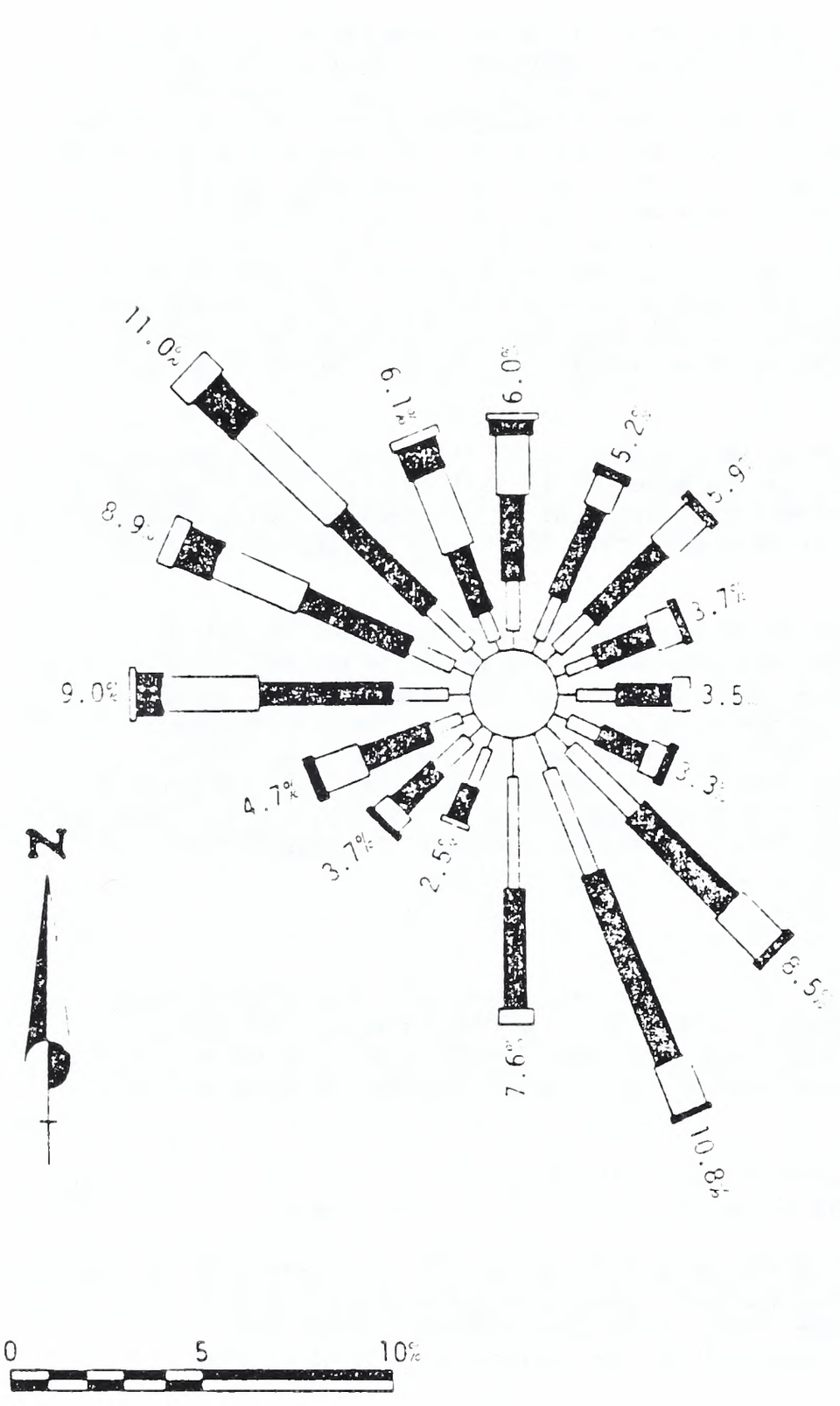
Relative humidity is highest in winter when it can reach 100%. Humidity steadily drops from the high of winter down to a low of about 48% in July. Mean annual wind speed is 5.6 mph. Fastest mean wind speeds occur typically in the spring and are slowest in the winter. High pressure usually dominates through most of winter and wind moves from high to low pressure. CONSOL (Consolidation Coal Company) reports that at CX Ranch they experience a wind direction distribution similar to that observed at Miles City. A wind rose for Miles City has been provided for illustrative purposes. Representative regional meteorological data is listed in Table II-4.

2. Air Quality

Air quality in this area has historically been excellent. Conditions which tend to concentrate pollutants do exist in this area, however. Therefore, potential air pollution problems must be considered. Conditions which have raised a concern are prolonged periods of depressed mixing heights and low windspeeds.

Pedco Environmental has analyzed the existing air quality in the North Decker area, which is near the area being considered by this assessment.

Background level for total suspended particulates (TSP) was determined to be 20 micrograms per cubic meter ($ug/m^3$). Annual geometric means in this area range from 9 $ug/m^3$ (Lame Deer 1978) to 56 $ug/m^3$ (Decker 1978). The fluctuation in TSP levels results from the impacts of various mining




Miles City Wind Rose

activities. There are no urban impacted sites. The state annual geometric mean standard is 75 $ug/m^3$.

Gaseous pollutants monitored in the area include sulfur dioxide ($SO_2$), ozone ($O_3$), and nitrogen dioxide ($NO_2$). No violations of federal or state standards have been reported. The Northern Cheyenne Indian Reservation is the only Class I designated location within the region and is located some 20 miles to the north. Visibility in the area ranges from 45 to 70 miles [U.S. Environmental Protection Agency (EPA) 1979].

The Roland and Smith coal seams may or may not be mined, depending on the amount of interburden present between these seams and the Anderson seam. Minerals Management Service will have to make a decision at mine plan submittal to determine if this coal will be taken, blended or spoiled. The contracts governing the coal sales will have a bearing on this determination as the contracts will specify what the coal quality must be.

TABLE II-4

Representative Regional Meteorological Data*

| | Regional Values |
|---|---|
| Humidity (Annual Average), % | 59 |
| Lake Evaporation (Annual Average), in. | 35-45 |
| Extreme Weather | |
| Thunderstorms, days/year | 30 |
| Tornadoes, sightings/year | 3-4 |
| Hail, days/year | 2-3.5 |
| Maximum Recorded Windspeed, **mph | 84 |
| Inversion Frequency (Base <1500 ft), % | |
| Annual | 85 |
| Seasonal Range | 73-87 |
| Mixing Height, ft | |
| Mean Annual Morning | 985-1310 |
| Mean Annual Afternoon | 5250-6560 |
| Mean Seasonal Afternoon Range | 2625-9190 |

* Sources:
Holzworth 1972.
DNRC 1974.
Northern Great Plains Resource Program 1974.
U.S. Department of Commerce 1975.

**Recorded at Sheridan, Wyoming.

# CHAPTER III
# ENVIRONMENTAL CONSEQUENCES

## A. TOPOGRAPHY

The postmining gross topography would be similar to premining topography. Smaller topographical features, such as knobs and smaller ridges would show a marked decrease in slope diversity. Over small areas, slopes would be smoother and more continuous. Many small knobs would not be replaced in the postmine topography.

Due to the swelling factor of mined overburden when placed back in the mined area the average elevation decrease of the mined ground would not be significant. The swelling factor would probably be about 1.16. Thus, 100 feet of over/interburden, when replaced in the mined area, would then have a thickness of about 116 feet.

## B. GEOLOGY

The interbedded sandstones, siltstones, shales and thin coals would be intermixed when placed back in the mined area. The present stratigraphic sequences will be obliterated.

Removal of the Anderson, D1 and D2 seams would preclude future utilization of these three coal seams. The Canyon seam would become economically valueless if not mined when the Anderson and Dietz seams are mined.

The subsurface fault structure would be destroyed. Some fossils in the spoils would be destroyed. Other fossils would be disturbed.

Rocks below or outside the mined area would not be disturbed.

Spoils material would have a decreased packing density with a swell factor of about 1.16. The primary effect of this bulk density change would be on the movement and quality of groundwater.

Groundwater would generally move faster through the spoils and groundwater TDS would increase.

## C. SOILS

Soil impacts from mining activities would include: displacement of soil from wind and water erosion, change in soil structure and natural fertility, and significant problems in revegetation and stabilization on steep slopes.

Disturbances of the soil would result in alterations of soil structure and porosity. This alteration would affect permeability, infiltration rates, soil-air and soil-water relationships and bulk density. The natural fertility would be affected by disruption of the nutrient cycle and a decrease in organic matter content within the soil.

The soil series in the Squirrel Creek EA area were evaluated for reclamation potential using U.S.D.A./S.C.S. guidelines for "Soil Reconstruction Material for Drastically Disturbed Areas" [NSH 403.6(a)]. These results were expressed as acre feet of soil material having good, fair or poor reclamation potential due to its physical and chemical properties. This showed 6% (473 acre feet) of the area rated as good reclamation potential, 40% (3,343 acre feet) rated fair and 54% (4,498 acre feet) rated poor.

Current information demonstrates that this area has poor potential for successful reclamation, however logical mining units with better and poorer reclamation potential may be located within the coal area. Suitable overburden materials, if available, could be used to provide additional soil depth to provide for more adequate reclamation.

The wind erosion potential for the tract is rated as 96% low and 4% moderate and the water erosion potential is rated as 3% low, 40% moderate and 57% high. The erosion potentials for each soil series is found in the Big Horn County Soil Survey.

D. HYDROLOGY

1. Ground Water

Impacts to ground water would occur primarily in the vicinity of the mined area. Impacts include removal or modification of aquifers, interruption of ground water flow during mining, modification of flow after reclamation, and changes in water quality. These impacts would involve the lowest coal aquifer and all aquifers above it. Uppermost coals, the Roland and Smith beds, are either burned or removed by erosion over most of the area and are not hydrologically significant. Coals of interest are, in descending order, the Anderson, Dietz 1, Dietz 2, and Canyon seams.

Dewatering of aquifers is coincidental with aquifer removal by pit development. A cone of depression, indicated by declines in potentiometric surfaces and realized by lowered well-water levels, results from ground water discharge to mine pits. Van Voast (1981) reports, in relation to two proposed mines in the area, that the greatest declines will be closest to the pits, and will be about 100 feet for the Anderson/Dietz and 300 feet for the Canyon coal. Van Voast goes on to say that the "areal extent of potentiometric declines will expand as mining progresses, being somewhat limited to the northwest and southeast by faults. The declines will probably be detectable as far to the southwest as Youngs Creek, and to the northeast will augment those caused by mining at Decker. The area of drawdown around the Decker mine is now detectable in the Squirrel Creek area, where declines have been ten feet or more."

Mining induced potentiometric declines would create a ground water divide between the new mine and the Decker mines, with the flow direction reversed to southwestward on the Squirrel Creek side of the divide.

Van Voast's Squirrel Creek study area is divided into three blocks that are bounded by southwest-northwest trending faults. These faults strongly control ground water flow. Drawdowns resulting from activity within the central block will be areally restricted by the structural faults that form its boundaries. Drawdowns in this block will be substantial and almost all of the area considered in this assessment is located within this block. Well inventory data (U.S. Geologic Survey and Montana Department of State Lands, 1977) show two stock or domestic wells producing water from coal beds in this area. Mining induced impacts would include either removal of the wells or substantially reduced well-water levels. Other wells affected would be study wells that mining companies have, and still may drill. New water sources must be obtainable before existing sources can be jeopardized by mining.

Bedrock and coal removed by mining would be replaced by spoil material. "Spoils aquifers are a relatively new phenomenon in the west, and although they play a significant role in postmining hydrology, little research has been conducted on them. The Montana Bureau of Mines and Geology began studying strip coal mine spoils aquifers at Colstrip, Montana in 1973; investigations were expanded to the Decker mine in 1975 as reclaimed spoils became available there. Since replacement of the spoils in the mined-out pit at Decker, a zone of saturation up to 46 feet has developed within the spoils. Results of initial studies (Van Voast, and others, 1978) indicate that groundwater in mine spoils is probably confined within coarse rubble resting on the mine floors, although the finer-grained, confining material above the rubble zone may also be saturated. Both the quality of ground water within the spoils and the yields of spoils-aquifer wells are highly variable." (Van Voast 1981)

Van Voast goes on to say that hydraulic conductivities and transmissivities for spoil material cover broad ranges, indicating it is strongly heterogeneous, like the overburden it once was. The ranges are considerably higher than those for sandstone beds, however, and the spoils are substantially better aquifers. Because mine spoils are new to the hydrologic system, some uncertainty exists regarding the permanence or stability of their hydrologic characteristics. Studies so far indicate that occurence and flow of ground water in mine spoils is not greatly different from conditions in undisturbed coal bed aquifers. It is also expected that water levels lowered during mining would return to near premining levels.

Quality of water entering mine pits differs very little from water in the aquifers being drained other than it will be a mixture of all aquifers contributing. Effluent quality would change as mining progresses and as ground water enters the pits by way of resaturated mine spoils. Van Voast synthesized water samples from overburden collected in this area. He extracted quality data from the samples according to two methods. His results show that expected spoil water quality would have TDS concentrations of 2,550 mg/l from one method and 2,860 mg/l from the other. Principle contributors were sodium, bicarbonate, and sulfate. These expected concentrations lie within the range found for nearby Decker spoils water. However, they were based on water quality from the upstream end of Van Voast's study area. Inflow from alluvium in the downstream end contains higher TDS concentrations, so spoils water there would correspond. Water quality anticipated is within the range accepted for livestock usage. Effects on the Tongue River from mine water would be undetectable under conditions of average river discharge and quality. Under unrealistically extreme conditions, dissolved-solids content in the river could theoretically be raised from 970 mg/l to 1,036 mg/l (Van Voast 1981).

These impacts from mining would be localized in the mine vicinity. Evidence indicates that no single mine can significantly alter the regional hydrologic picture. Effects from multiple mines in an area are still being studied. A first-cut evaluation on this subject is described in a report on 10 active and proposed mines above Tongue River Dam by Van Voast and Thompson (1982). Their results show that the median increase in the Tongue River's dissolved-solids content, from ground water contributed by nine mines, would be 30 mg/l.

2. Surface Water

Four stock reservoirs that collect ephemeral surface water are known to exist in the area. If they are removed by mining, replacement may be necessary during reclamation. Water quality would deteriorate due to increased sediment outputs from surface disturbance and from exposure to mine spoils, unless the impacts are mitigated by sediment traps and diversions. Surface water diverted around the mine must be transported in properly designed channels. Rapid reclamation of disturbed surfaces is needed to prevent water quality degradation by sediment loading.

The alluvial valley floor around Squirrel Creek has been identified by the Office of Surface Mining (OSM) and the Montana Department of State Lands (DSL) to be significant for approximately 87 acres of this area. These lands are flood irrigated or subirrigated hay lands which have substantially greater production than native rangeland. They are unsuitable for surface mining unless exempted by DSL.

E. LAND USE

1. Vegetation

If the 3,542 acres of range were in excellent condition (76-100%) and the entire area were mined, there would be an approximate loss of 854 to 1,181 AUMs. However, in its present condition, the loss would be approximately 744 AUMs.

Mining of the area would temporarily eliminate grazing opportunities for domestic livestock. However, vegetative production may be better after mining due to extensive reclamation work. The area may produce more than the current number of AUMs per acre. There is, however, no evidence that the plant community which ultimately evolves would support higher levels of livestock grazing than the premining vegetation supported.

Additional impacts resulting from vegetation disturbances would be: (a) possible reduction of visual aesthetics, (b) increased soil erosion, and (c) reduction in the amount of wildlife and livestock forage.

2. Agricultural Production

The proposed action would have an insignificant impact on agriculture in the tract. If mined, 303 acres currently utilized as cropland would be disturbed.

Two operators in the area would be affected by mining. The smaller operator has approximately 159 acres of cropland, all located outside the coal area. The larger operator has approximately 811 acres of cropland (3.3 percent of his total operation) with approximately 303 acres of cropland (7.9 percent of the total acreage within the tract and 37.3 percent of the operator's cropland) within the coal area.

The major crops grown in the area are tame pasture and hay (alfalfa or grass-legume) and small grains.

3. Recreation

Private hunting has been the main recreational activity within the proposed mining area. However, loss of habitat for mule deer, antelope, sage grouse and sharp-tailed grouse may have a minor affect on future hunting of these game animals in areas adjacent to the mine. Public recreation within the EA area would not be affected because access has been denied in the past.

4. Transportation and Access

Approximately 18 acres of right-of-way and buffer zone along Montana Highway FAS 314 has been declared unsuitable for mining. Until a relocation plan can be agreed upon, the highway right-of-way cannot be mined.

The private road leading to the CX Ranch headquarters will be relocated during the mining activity. The relocated road will be graded and graveled to accommodate increased traffic. Additional roads are scheduled to be constructed within the mine area to accommodate the mining activities.

No rights-of-way other than Montana FAS 314 would be affected.

5. Agricultural Economics

The EA coal area is located in a sparsely populated portion of Big Horn County near the Wyoming border. The lands are presently used for raising cattle, hay, and some grain.

Development of coal would temporarily displace this agricultural production. To evaluate this issue, it was necessary to compare agricultural production to the value of the coal to be developed. The trade-off is compared several ways.

The first method of evaluation was to compare net national value of agricultural production displaced with the net national value of coal produced. In this evaluation, it was assumed the value of coal is 12.5% (royalty rate) of the going market rate of $10 per ton. The net value of agricultural production is the cash rent to the owner. A "worst case" scenario was assumed for agriculture, that is, the area would not be reclaimed. Since agricultural production would be lost on each acre, year after year, these

losses were totalled to show losses in perpetuity. By comparison, coal output per acre is gained only once. To place agricultural production and coal on the same basis, it was necessary to discount the value of agricultural production in future time periods.

Using these assumptions, the return to national income from coal production would be 4,654 times greater than agricultural production. (See Table III-1.)

Another way of comparing trade-off between coal and agricultural resources is to determine what coal would have to sell for to be equal to agricultural production displaced. This avoids assuming that all coal in the area could be sold for the going market value. Coal would have to sell for $.00027 per ton to equal the net agricultural value displaced. (See Table III-1.)

In reviewing regional impacts, an additional comparison can be made of displaced agricultural production to Big Horn County's total agricultural production. The loss from this tract is .09% of the county's total agricultural production. (See Table III-2.)

Regional loss of agricultural production, if coal is mined, has been compared to the regional gain from coal, using regional multipliers from the U.S. Water Resource Council.

The gross regional loss from agriculture for each year is equal to $73,078. The computed yearly regional earnings loss from agriculture would be $17,807. (See Table III-3.)

Assuming the mining of eight million tons of coal per year at a price of $10.00 per ton, FOB mine mouth, the gross regional gain per year from coal would be $175,280,000. Regional earnings each year would be more than $50 million. (See Table III-4.)

The assumption of eight million tons per year should not be used by planners for planning. This figure was used to portray what the regional earnings could be, if coal were mined. There is adequate coal to support this production rate, however market conditions will be the determining factor as to how much coal would be mined and when.

This comparison of regional earnings shows if coal is developed, the regional earnings would be many times greater than the present regional earnings from agriculture. This would be of special interest to Sheridan, Wyoming, as the majority of trade would be in that area.

A "worst case" scenario was used in the above comparisons, assuming that the areas would not be reclaimed. Existing state and federal laws require the lands to be returned to at least premining conditions. Reclamation feasibility must be demonstrated in the mine plan submission.

F. WILDLIFE

Antelope and sage grouse would be directly affected if the area is mined, because of the loss of yearlong sagebrush-grassland habitat. This would have a minor effect on the area-wide populations, were it not for the

TABLE III-1

COMPARISON OF VALUE OF AGRICULTURAL PRODUCTION DISPLACED TO VALUE OF COAL PRODUCTION

| | AGRICULTURAL PRODUCTION | | | | | | | COAL PRODUCTION | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coal Area | 2/ Crop | Acres | 3/ Annual Agri Production | Net Value Per Unit | Total Annual Net Value/$ | 4/ Total Present Value at 10% | 5/ Per Acre Loss If Mined | Acres | Tons/Acre 90% Recoverable | 6/ Net Value Per Ton $ | 7/ Total Present Value | 8/ Ratio to Agri. Prod. | 9/ Value Per Ton to Equal Ag. Prod. |
| Squirrel Creek | Wheat | 166 | 4,075 bu | $1/bu | $ 4,075 | $ 40,750 | | | | | | | |
| | Hay | 15 | 13 tons | $20/ton | $ 260 | $ 2,600 | | | 10/ | | | 4,654 | $.00027 |
| | 1/Tame Pasture | 122 | 119 AUMs | $10/AUM | $ 1,190 | $ 11,900 | $ 33.71 | 3,846 | 125,514 | $1.25 | $ 603,410,000 | to | |
| | Rangeland | 3,543 | 744 AUMs | $10/AUM | $ 7,440 | $ 74,400 | | | | | | 1 | |
| | TOTAL | 3,846 | | | $ 12,965 | $ 129,650 | | | | | $ 603,410,000 | | |

1/ Includes irrigated pasture

2/ Wheat, hay and tame pasture acres and production (see agriculture section) Rangeland acres and production (See Range Section)

3/ Annual agricultural production x net value per unit

4/ Total present value discounted at 10% lost in perpetuity

5/ Total present value/total acres

6/ 12.5% x assumed value of $10.00 per ton at mine mouth

7/ Acres x tons/acre x net value per ton

8/ Total present value (coal)/total present Value (Agriculture)

9/ Agricultural production per acre loss if mined/ tons per acre

10/ 536.36 Millions -:3846 x .90

TABLE III-2

Comparison of Coal Area Annual Agricultural Production to County Annual Agricultural Production

| COUNTY | COAL AREA | WHEAT/bu | | HAY/tons | | CATTLE/AUMs | | 4/ | 5/ | 6/ |
|---|---|---|---|---|---|---|---|---|---|---|
| | | ANNUAL PRODUCTION | 1/ ANNUAL SALES | ANNUAL PRODUCTION | 2/ ANNUAL SALES | ANNUAL PRODUCTION | 3/ ANNUAL SALES | GROSS ANNUAL AG SALES $ | GROSS ANNUAL AG SALES BY COUNTY $ | PERCENT OF COUNTY AG. PROD. DISPLACED |
| Big Horn | Squirrel Creek | 4,075 | $13,080 | 13 | $650 | 863 | $17,260 | $30,990 | $33,722,000 | .092% |

1/ Montana Agricultural Statistics, Vol XVIII, Dec. 81, Color World Montana, Inc. Bozeman, MT
1979 Value $3.21 per bushel x total bushels = Annual value of wheat production.

2/ Tons x 2000 lbs. ÷ 800 lbs. = AUMs ÷ 15 = cow units; cow units x $300 sales per cow unit = annual value of hay expressed in terms of cattle sales.

3/ AUMs ÷ 15 AUM/cow = cow units; cow units x $300 sales per cow unit - value of annual cattle production.
Source: ERS Budgets and public and private grazing resources in Montana with emphasis on Forest Service Grazing, Montana Experimental Station Research Report 164, Nov. 1980.

4/ Total of three annual sales columns.

5/ 1978 Census of Agriculture, Vol, Part 26, U.S. Department of Commerce, Bureau of Census, Government Printing Office, Washington, D.C., June 1981.

6/ Gross annual agricultural sales/gross annual agricultural sales by county x 100 - percentage.

TABLE III-3

POTENTIAL REGIONAL LOSS FROM AGRICULTURAL PRODUCTION IF COAL IS MINED

| Product | Yield | Gross Sales Per Year | 1/ Gross Output Multipliers | Gross Regional Loss Per Year | 2/ Computed Earnings Multiplier | Total Regional Earnings Loss Per Year |
|---|---|---|---|---|---|---|
| Cattle and Hay converted to AUM's | 59.7 cow units | $17,910 | 2.581 | $46,225 | .24 | $11,094 |
| Wheat | 4075 bu. | $13,080 | 2.053 | $26,853 | .25 | 6,713 |
| TOTAL | | $30,990 | | $73,078 | | $17,807 |

1) Regional Multipliers, U.S. Water Resources Council, U.S. Govt. Printing Office, Wash., D.C., 1977

2) (1/Gross Output Multiplier) (Earnings Gross Output Ratio By Industry) + (1 - 1/Gross Output Multiplier) (National Earnings Gross Output)

Whereas:

Gross Output Multipliers
- Cattle = 2.581
- Wheat = 2.053

Earnings Gross Output Ratio By Industry
- Cattle = .158
- Wheat = .201

National Earnings Gross Output = .3008

TABLE III-4

POTENTIAL REGIONAL GAIN FROM COAL PRODUCTION IF MINED

| Total Tons Per Year | Estimated Price Per Ton | Total Gross Value | 1/ Gross Output Multipliers | Gross Regional Gain Per Year | 2/ Computed Earnings Multiplier | Total Regional Earnings Gain Per Year |
|---|---|---|---|---|---|---|
| 8 million | $10.00 | $80 million | 2.191 | $175,280,000 | 0.34 | $59,595,200 |

1. Regional multipliers, U.S. Water Resources Council, U.S. Govt. Printing Office, Wash. DC, 1977.

Computation:

2) (1/2.191) (.388) + (1 - 1/2.191) (.3008)

(.456) (.388) + (.544) (.3008)

.177 + .164 = .34

existence of several other existing and proposed mines in the surrounding area. A cumulative loss of habitat would occur if reclamation efforts would not restore the vegetative composition needed by antelope and sagegrouse.

In addition to the yearlong habitat, unsuitability criterion number 15 identified 154 acres of sage grouse winter range and 413 acres of antelope winter range within the area being considered. These two winter ranges were not found to be unsuitable, but are leasable with reclamation stipulation.

A total of 40 acres of riparian habitat along Squirrel Creek were found to be unsuitable under criterion 15. This finding precludes mining of the riparian habitat.

Raptors dependent on the cliffs and sandstone outcrops for nesting sites would be displaced, if these areas were mined. Great horned owls, prairie falcons, red-tailed hawks and kestrels would be the primary species affected. The extent of impact would be dependent on the availability of alternate nest sites. The nest sites for two pair of golden eagles would not be destroyed but there would be a reduction in prey base with mining of portions of the eagles' hunting territories. This would be a slight impact.

Mule deer and white-tailed deer would not be significantly affected by mining. Mule deer winter ranges are located to the north and east of the area, while whitetails tend to move down to the Tongue River bottoms during the winter. There would be a slight loss of forage and cover. Small mammals and birds would be most affected by direct loss of habitat. However, the losses relative to what would be unaffected is not significant.

Initial recovery of the area to sagebrush-grassland, if allowed to return, would probably not be seen in less than 10 years from the beginning of mining. Complete return, if allowed, would not result until long after mining was terminated. Cliffs and sandstone outcrop habitats would not likely be reclaimed.

G. CULTURAL RESOURCES

Cultural resources in mining areas are subject to impact over the life of the mine from construction of mine facilities, haul roads, water development and mining activity. Cultural resources not immediately impacted by the above developments are subject to impacts from increased erosion, access, and vandalism. Impacts thus would be both direct and indirect. The effects of mining would be irreversible.

At this time, criterion 7 for unsuitability has been applied to all but the following sites in the lease area:

| | | |
|---|---|---|
| 24 BH 2103 | 24 BH 2129 | 24 BH 2134 |
| 24 BH 2124 | 24 BH 2132 | 24 BH 2135 |
| 24 BH 2128 | 24 BH 2133 | |

Six sites meet the criterion for unsuitability, to which the exception has been applied. Mitigation plans have been submitted to Consolidation Coal Company by Historical Research Associates (1981:Appendix c) for the following seven sites:

| | | |
|---|---|---|
| 24 BH 1001 | 24 BH 1949 | 24 BH 2125 |
| 24 BH 1030 | 24 BH 1950 | |
| 24 BH 1944 | 24 BH 2091 | |

The site 24 BH 1944 is an extremely large workshop, and is included in the list of sites requiring further work (Chapter II) for determination of eligibility to the National Register of Historic Places and application of unsuitability criterion number 7.

The 1982 MFP Amendment added 560 uninventoried acres to the CX-Decker inventory area. This acreage is reduced by 40 acres due to a survey at the adjacent Pearl Mine (Gregg 1977). Lands requiring a Class III inventory include:

T9S, R39E; Section 27: NE1/4, SE1/4NW1/4, N1/2, SW1/4SE1/4, E1/2SW1/4 (400 acres)
Section 34: W1/2NE1/4, SW1/4SE1/4 (120 acres less WY-MT boundary adjustment)

In summary, criterion seven has been applied to 41 of 49 sites in the proposed lease area; the preliminary recommendation for eight sites, pending SHPO consultation, is that they do not meet the qualifications for eligibility to the National Register and are suitable for mining. Of the 41 sites to which the criterion has been applied, seven are determined unsuitable, while 11 require further evaluation. The exception to the criterion for unsuitability permits mitigation of affected sites, therefore the sites determined unsuitable are declared suitable pending mitigation of the properties. Mitigation is accomplished by collection, excavation, recording, analysis and reporting to preserve information existing in the sites.

The unsuitability criterion has not been applied to the unsurveyed portions of sections 27 and 34. These areas will have to be inventoried before any mining or associated activities could occur.

H. VISUAL RESOURCE MANAGEMENT

Mining facilities, including coal crushers, shops and offices, sediment ditches and ponds, sewage treatment system, coal storage silos, aerial conveyor, loadout bins, railroad loop, etc., are scheduled to be constructed near Montana Highway FAS 314. Consol has requested permission of the Montana Department of State Lands to construct these facilities by the highway. These facilities would be visible from the highway and aesthetically would not lend themselves to the surrounding area. Also, dust caused by the proposed mining operation would be visible from the highway.

That portion of Squirrel Creek which borders the NE part of the permit area would not be disturbed. This section of the creek and the surrounding riparian zone has been rated as Class B scenery. Most of the remaining area has been classified as Class C scenery.

I. ECONOMIC AND SOCIAL CONDITIONS

Studies have shown that workers are willing, in spite of the expense (both financial and time) to commute long distances rather than to live in small communities. Quality of life factors that influence workers' choice of residence are schools, shopping facilities, local services (medical and dental are of special importance) and housing availability.

As a result, the city of Sheridan and the surrounding area would receive the greatest impact if coal is mined. This city has experienced the impact of accelerated growth in the past from construction of other coal mines in the area. The area government has done a good job in planning and has overcome many of the problems created by coal development, even though Sheridan city or county governments receive no revenue from the actual mining of coal in Montana.

If this coal area were developed in today's economy, the impacts would be less severe, as some mines in the area have reduced production due to a soft market. Therefore many workers could be available to fill the requirements of a new mine and eliminate a new surge of people. However, world situations could change and create a large demand for coal, which could bring more people to the area. This makes planning extremely difficult. Close coordination is required between the coal companies and city planners to mitigate impacts.

The State of Montana and Big Horn County would gain if coal is developed and would receive very little impact caused by an influx of people. Royalty and severance tax figures that could be received are displayed in Table III-5.

J. CLIMATE AND AIR QUALITY

Impacts on climate from the proposed action would be localized and insignificant. The modification of surface contours and surface reflection due to redistribution of soils and removal of vegetation may produce slight localized changes in wind-speed and direction, temperature, and humidity. Reclamation, with reestablishment of vegetation, would largely mitigate these impacts over the long term.

The methodology for determining the air quality impact of particulate emissions consisted of: (1) obtaining a mine profile for the tract, (2) obtaining emission factors for individual surface coal mining operations, (3) using the mine profile and emission factors for calculations of total emissions, (4) entering the emission data into a modified climatological dispersion model for prediction of ambient concentrations, and (5) comparing predicted concentrations to national and state air quality standards and to Prevention of Significant Deterioration (PSD) increments. The air quality impacts were analyzed for the peak production year.

TRC Environmental Consultants modeled the Squirrel Creek area with specific information provided from the CX Ranch Mine permit application. Consol chose

TABLE III-5

POTENTIAL INCOME TO THE STATE OF MONTANA

FROM FEDERAL ROYALTIES IF COAL IS MINED AT $10.0 PER TON

| COAL AREA | FEDERAL ACRES | 1/ ESTIMATED RECOVERABLE TONS PER ACRE | 2/ FED ROYALTY PER ACRE @12.5% | 3/ MONTANA SHARE OF FEDERAL ROYALTY PER ACRE | 4/ MONTANA SHARE (50%) OVER LIFE OF MINE | 5/ MONTANA SEVERANCE TAX (30% OF VALUE OF ALL COAL MINED |
|---|---|---|---|---|---|---|
| Squirrel Creek | 3,846 | 125,523 | 156,904 | $78,452 | $ 30,173,000 | $1,448,300,000 |

1/ 90% recoverable factor used

2/ Recoverable tons x $1.25 royalty

3/ 50% of federal royalties

4/ Federal acres x Montana Share of federal royalty per acre

5/ 30% of value of all recoverable coal mined

to use the PAL (Point, Area and Line) model for short term impacts in predicting the expected maximum 24-hour concentration. For long term impacts, which are indicated by the annual geometric mean, the ISC (Industrial Source Complex) model was used.

Results of the modeling exercise were provided by the Montana Air Quality Bureau and can be compared with applicable air quality standards. The 1970 Clean Air Act Amendments established primary and secondary National Ambient Air Quality Standards (NAAQS). Montana also has established air quality standards. These standards are shown in Table III-5. The Montana primary standard for total suspended particulate is the same as the corresponding Federal standard.

The proposed CX Ranch Mine is a potential 16 million ton per year operation, which is large for this area. Modeling efforts used information corresponding to the peak production year. Best available control technology is required for new pollutant sources and was considered when emission factors were determined. Concentrations derived from modeling are for areas outside the active mining area, because those areas within, such as the mine facilities, pit areas, and reclamation areas, are not subject to standards.

Annual geometric mean for background concentrations of total suspended particulates (TSP) was inventoried to be 23.4 ug/$m^3$. The Consol mine was considered by itself when examining compliance with ambient air quality standards. The annual geometric mean was determined to be 49.7 ug/$m^3$, which included background concentrations. This is well within the state standard of 75 ug/$m^3$. Background TSP level for the 24-hour concentration is 19.7 ug/$m^3$. Total 24-hour concentration indicating maximum short term impact was modeled to be 118.7 ug/$m^3$. This predicted concentration includes background levels and is within the state standard of 200 ug/$m^3$.

In addition to the annual and maximum particulate standard, Montana has a PSD (Prevention of Signficant Deterioration) incremental standard which dictates the maximum increase in ambient pollution levels for two pollutants, TSP and sulfur dioxide. This area has been designated PSD Class II, which allows for moderate, well-controlled growth. Sulfur dioxide is not a pollutant produced from coal mining itself and will not be considered under PSD standards.

Unlike ambient air quality standards, PSD standards require pollution from all new sources in an area to be counted against the allowable increase. Modelling for PSD increment requirements, therefore, included the Nerco mine as well as the CX Ranch Mine. Increases in coal dust from the two mines was modeled to be 32.56 ug/$m^3$ (for the 24-hour averaging time), which is within the 37 ug/$m^3$ allowed. Annual increment consumption was modeled to be 5.83 ug/$m^3$, which is also within the 19 ug/$m^3$ allowed.

Several small sources of gaseous pollutants (sulphur dioxide, ozone, and nitrogen dioxide) are associated with surface coal mining operations. These include haul trucks, front-end loaders, scrapers, and dozers. Sources also include light-duty vehicles (chiefly pickup trucks) operated in the mine and employee vehicles operated on mine access roads. Unit trains used to transport the coal from the site are also a gaseous emission source.

Review of Site Specific Analysis Reports for Powder River tracts show that typical coal mining operations produce such small quantities of gaseous

TABLE III-6
AMBIENT AIR QUALITY STANDARDS

| Pollutant | Averaging Time | Federal Primary Standards Micrograms/Cubic Meter ($ug/m^3$) | Federal Primary Standards Parts/Million (ppm) | Montana State Standards Micrograms/Cubic Meter ($ug/m^3$) | Montana State Standards Parts/Million (ppm) |
|---|---|---|---|---|---|
| Sulfur Dioxide | Annual (Arithmetic) | 80 | 0.03 | 60 | 0.02 |
| | 24-hour | 365 | 0.14 | 260 | 0.10 |
| | 3-hour | | | 650 | 0.25 |
| Total Suspended Particulate | Annual (Geometric) | 75 | | 75 | |
| | 24-hour | 260 | | 200 | |
| Carbon Monoxide | 8-hour | 10,000 | 9 | | |
| | 1-hour | 40,000 | 35 | | |
| Photochemical Oxidant | 1-hour | 240 | 0.12 | | |
| Nitrogen Dioxide | Annual | 100 | 0.05 | | |
| Lead | 3-month | 1.5 | | | |

PREVENTION OF SIGNIFICANT DETERIORATION (PSD) REGULATIONS

| Class II Area | Micrograms/Cubic Meter ($ug/m^3$) |
|---|---|
| Sulfur Dioxide | |
| Annual Arithmetic mean | 20 |
| 24-hour maximum | 91 |
| 3-hour maximum | 512 |
| Particulate matter | |
| Annual Geometric mean | 19 |
| 24-hour maximum | 37 |

Source: National Ambient Air Quality Standards 1970; Montana State Department of Health and Environmental Sciences

pollutants, that they are not usually modeled. Gaseous emissions are not expected to violate any air quality standards.

Visibility reduction from particulates generated by mining activity was modeled for the North Decker Tract by PEDCO Environmental. They found that median summer visual range is about 60 miles. From the hypothetical viewing point used in the first analysis, on days with visibility of 70 miles, visibility reductions resulting from the second-highest 24-hour concentration would be a maximum of 0.1 mile with proposed action for that tract. When looking from the Northern Cheyenne Indian Reservation towards the proposed lease tract, visibility reductions resulting from the second-highest 24-hour concentrations would be a maximum of 0.1 mile. Conditions for the Squirrel Creek area are expected to be quite similar to those for the North Decker tract.

K. SHORT TERM VERSUS LONG TERM IMPACTS

1. Geology/Minerals

Short term impacts would be the disruption of the surface features during mining of the Anderson, Dietz One and Dietz Two coal seams.

If the Canyon seam is not mined because of excessive overburden, it would be lost for future use. Mining of the Smith and Roland seams, but not utilizing the coal because of their poor quality, would be a one-time loss of this resource. Once mined, it would not be recoverable for future use.

2. Soils

Short term soil impacts include soil compaction from haul roads and facility construction, soil displacement by wind and water erosion and alteration of soil structure, horizonation and natural fertility.

Long term and residual impacts to the soil would be comparable. These would include: structural changes of soil particles due to disturbing the surface and subsurface horizons and changes in natural fertility by disrupting nutrient cycling, microbial action and decreasing organic matter content.

As the area is reclaimed, rebuilding of soil horizons would change soil porosity, permeability and infiltration rates, and soil, air and water relationships. Salinity content would increase as subsurface calcareous material is brought to the surface.

3. Hydrology

Ground water levels in the vicinity of the mine would be lowered during mining; however, they would be established to near premining levels readily after reclamation. Reclaimed spoil aquifers contain two to three times the mineralization of the original aquifer and this would create a short-term impact on water quality from spoil aquifers. In the long term, the water would gradually return to approximately the same quality as the average quality in the removed aquifers.

4. Vegetation

The short term effect would be a temporary loss of 3,543 acres (744 AUMs) of native vegetation and 303 acres of cropland during the mining and reclamation process. As yet, there is no evidence to support the complete success of

reclamation using predominantly native species capable of withstanding and supporting sustained livestock grazing. However, productivity studies in southeastern Montana have proven successful in the short term by using introduced species.

The long term and most serious effect on vegetation would be the loss of the natural vegetation mosaic and species diversity. The overall long term effect on reclaimed sites in eastern Montana are not known.

5. Wildlife

In the short term all species of wildlife, particularly antelope and sage grouse, would be displaced from the area actively being mined. In the long term, wildlife population numbers and diversity would depend upon the success of reclamation efforts. If the area cannot be restored vegetatively to near original condition, the resultant wildlife populations and diversity would be dependent on the type of vegetative cover and habitat established. If a greater habitat diversity is established, effects on wildlife populations would be positive. If habitat diversity is decreased, effects would be negative.

6. Socioeconomics

Agricultural output would show a loss as land is disturbed by mining. After reclamation, agricultural production would be returned.

The city of Sheridan would receive the impact created by an influx of people. Some disruption of present social patterns could develop in the short term, but in the long term, stability would be reestablished in the area. Regional income would increase due to this influx of people.

The city of Sheridan and Sheridan County would receive no royalties or severance tax from coal production under existing law.

Some of the local ranchers could supplement their depressed present agricultural income during construction and operational phases of a new mine.

The potential for employment of Northern Cheyenne and Crow Indians would increase during the construction and operational phases of the mine.

The proposed new townsite (Spring Creek) in Montana could relieve some of the requirements for new housing from Sheridan, if the townsite is developed. Permanent housing may not necessarily be the choice for construction workers, but could appeal to the operational personnel. Increased gasoline prices could also increase the demand for housing located closer to the work area. The value of removed coal would be lost forever due to mining.

7. Cultural Resources

Construction of mine facilities, haul roads, water development and mining activity would destroy 40 prehistoric and/or historic sites based on present inventory.

Increases in cultural resource destruction through recreational artifact collecting and vandalism would accompany an increased population of the area. However, this impact is not quantifiable.

L. LEASE STIPULATIONS

Five areas were found to be unsuitable for mining in the 1982 MFP Amendment. These were:

Criterion 3 - One-half mile of Montana Highway FAS 314 and a buffer zone of 100 feet on either side of the right-of-way for a total of 18 acres.

The exception could not be applied as a formal agreement to move the road does not exist at this time. An exception may be applied at a later date, provided all parties involved agree on a relocation plan.

Criterion 7 - 520 acres of the EA area must be surveyed for cultural resources and the unsuitability criterion applied before a mine plan can be approved. Mitigative measures (avoidance, stabilization and protection or data recovery of cultural resource values) for all portions of the EA area, will be implemented in the case of presence of National Register designated or eligible properties, prior to mine plan approval.

Criterion 15 - 51 acres of riparian habitat were identified as unsuitable because of the high wildlife use which occurs in this area. No exception was applied.

A total of 154 acres of sage grouse winter range and 413 acres of antelope winter range were identified but these areas were not found to be unsuitable if the following conditions are met: "A mitigation plan for the sage grouse and antelope wintering grounds will require any successful bidder to show, and the State of Montana to agree, that all or stipulated methods of mining will not have a significant long term impact on the area-wide species habitat. Reclamation and management of reclamation areas, must also provide suitable post-mining habitat. This land would then be considered suitable for leasing and the mitigation plan would become a lease stipulation. If the State of Montana does not agree that reclamation and management of reclaimed lands would provide suitable post-mining habitat, the wintering grounds will be excluded as unsuitable prior to issuance of a lease. This mitigation does not preclude the Montana Department of State Lands from enforcing its selective denial and unsuitability process."

Criterion 19 - The BLM did not find any of the Squirrel Creek AVF to be unsuitable. As part of th CX and Wolf Mountain Mines permit applications process, DSL and OSM identified 87 acres in the EA area to be unsuitable for mining.

The AVF determination overlapped the riparian habitat delineation by 47 acres, so the actual acreage found unsuitable along the Squirrel Creek bottom was 91 acres. The location of these areas is shown on Map 3.

## CHAPTER IV
## CONSULTATION

In preparation of this environmental assessment, the Bureau of Land Management contacted or consulted with the following:

Montana Department of Fish, Game & Parks
Montana Department of State Lands
Montana Historical Society (State Historic Preservation Office)
Montana Bureau of Mines and Geology
Montana Department of Natural Resources and Conservation (Water Rights Bureau)
County Engineer's Office, Sheridan County, Wyoming
United States Department of Agriculture (Soil Conservation Service)
U.S. Fish and Wildlife Service

Also for a list of individuals consulted, refer to the List of References.

# LIST OF REFERENCES

## Geology


USGS Bulletin 341: Contributions to Economic Geology. 1907 Part II The Sheridan Coal Field, Wyoming, by J.A. Taff

CX Ranch Project Report, Consolidation Coal Co., Geologic & Quality Maps, Vol II December 1979

CX Ranch Mine, Proposed Mine Plan. Vol. 4. December 1981


## Soils


U.S. Department of Agriculture, Soil Conservation Service and U. S. Department of the Interior, Bureau of Indian Affairs in cooperation with Montana Agricultural Experiment Station. 1971. Soil Survey of Big Horn County Area, Montana.

U.S. Department of Agriculture, Soil Conservation Service, National Soils Handbook 403.6(a).

U.S. Department of the Interior, Bureau of Land Management, 1981. Powder River Resource Area Management Framework Plan Draft Amendment.

U.S. Department of the Interior, Bureau of Land Management, 1982. Powder River Resource Area Management Framework Plan Final Amendment.


## Hydrology, Climate and Air Quality


Van Voast, W.A., and K.S. Thompson. 1981. Hydrology of the Lower Squirrel Creek Drainage, Southeastern Montana, with Special Reference to Surface Coal Mining. Open File Report 84. State of Montana Bureau of Mines and Geology, Butte, MT.

Van Voast, W.A. and K.S. Thompson. 1982. Estimates of Post-Mining Water Quality for the Upper Tongue River, Montana and Wyoming. Hydrogeologic Map 5. State of Montana Bureau of Mines and Geology, Butte, MT.

U.S. Department of Interior. Bureau of Land Management. 1981 Powder River Resource Area MFP Amendment.

Consolidation Coal Company. CX Ranch Mine Application for Surface Mining Permit. 1981

Kiewit Mining and Engineering Company. Wolf Mountain Mine Surface Coal Mine Permit Application. 1982

U.S. Department of Interior. Bureau of Land Management, 1981. Site Specific Analysis, North Decker Tract by PEDCo Environmental

Cultural

Gregg, Michael L.
1977 Archaeological Survey of the Pearl Area. Report of Investigations No. 3. Division of Archaeology and Cultural Resources, Mineral Research Center, Montana Tech Alumni Foundation, Butte, Montana.

HRA: Greiser, Sally T., Alan S. Newell ed.
CX Ranch Project, Cultural Resource Inventory. Prepared for Consolidation Coal Company, Sheridan, Wyoming. 15 Sept. 1981. Missoula, Montana

CFR (proposed)
N.D. §3461.1 Criteria for assessing lands unsuitable for all or certain stipulated methods of coal mining.

Wildlife

Amstrup, Steven C. 1976. Effects of coal strip mining habitat use, activities and movements of pronghorn antelope. (Antilocapra americana). Unpubl. Prog. Rep., Denver Wildlife Res. Center, 19 pp.

_____. 1976b. Effects of coal strip mining on habitat use, activities and population trends of sharp-tailed grouse. Unpubl. Prog. Rep., Denver Wildlife Res. Center. 12 pp.

_____. 1977. Effects of coal strip mining on habitat use, activities and population trends of sharp-tailed grouse (Pedioecetes phasianellus). Unpubl. Prog. Rep., Denver Wildlife Res. Center. 29 pp.

_____. 1978a. Effects of coal strip mining on habitat use, activities and movements of pronghorn antelope (Antilocapra americana). Unpubl. Prog. Rep., Denver Wildlife Res. Center. 20 pp.

. 1978b. Activities and habitat use of pronghorns on Montana-Wyoming coal lands. pp. 270-306 in Proc. of Eighth Biennial Pronghorn Antelope Workshop. Jasper, Alberta, Canada.

Biggins, Dean E. 1976. Effects of coal strip mining on habitat use and activity patterns of mule deer (Odocoileus hemionus). Unpubl. Prog. Rep., Denver wildlife Res. Center. 29 pp.

. 1977. Effects of coal strip mining on habitat use and activity patterns of mule deer (Odocoileus hemionus) and white-tailed deer (O. virginianus). Unpubl. Prog. Rep., Denver Wildlife Res. Center. 32 pp.

_____. 1978. Effects of coal strip mining on habitat use and activity patterns of mule deer (Odocoileus hemionus) and white-tailed deer (O. virginianus). Unpubl. Prog. Rep., Denver Wildlife Res. Center. 9 pp.

_____. 1979. Effects of coal strip mining on habitat use and activity patterns of mule deer (Odocoileus hemionus) and white-tailed deer (O. virginianus). Unpubl. Prog. Rep., Denver Wildlife Res. Center. 12 pp.

Coenenburg, J.G., E.J. DePuit, and W.H. Willmuth. 1977. Wildlife vegetation classification system. Unpubl. Rep., Mont. Agric. Exp. Sta., Mont. State Univ., Bozeman.

_____. and E.J. DePuit. 1979. Baseline wildlife studies, Crow Lease, southeastern Montana, 1975-76. Mont. Agric. Exp. Sta., Mont. State Univ., Bozeman. 133 pp.

Ecology Consultants, Incorporated. 1976. An evaluation of early autumn populations of small mammals near Decker, Montana. Report for Peter Kiewit Sons' Company, Sheridan, Wyoming. 37 pp. Farmer, Patrick J. 1977. Terrestrial Wildlife Survey, Pearl area, Montana. June, 1976-June, 1977. Tech. Rep. by Western Technology and Engineering, Inc. for Shell Oil Co. 135 pp.

_____. 1978. Terrestrial Wildlife monitoring study, Pearl area, Montana. June, 1977-May, 1978. Tech. Rep. by Western Technology and Engineering, Inc. for Shell Oil Co. 142 pp.

Knapp, Steven J., 1977. Birney-Decker wildlife study - Final Rep., Mont. Dept. Fish and Game, Helena. 163 pp.

Lockhart, Michael J., and Terrence J. McEneaney. 1978. The effects of coal development on the ecology of birds of prey in southeastern Montana and northern Wyoming. Unpubl. Rep., Denver Wildl. Res. Center. 19 pp.

_____, Terrence P. McEneaney, and Albert L. Harting, Jr. 1977. The effects of coal development on the ecology of birds of prey in southeastern Montana and northern Wyoming. Ann. Prog. Rep. Denver Wildl. Res. Center.

Olson-Elliott and Associates. 1979. CX Ranch environmental base evaluation. Final Report to Consolidation Coal Company, Sheridan, Wyoming.

OER Research. 1981. Wildlife Inventory, CX Ranch Mine Project, Volume II. Mine Plan submitted for Consolidation Coal Company, Sheridan, Wyoming.

Renewable Resources Consulting Services, Ltd. 1978. Study of small mammals in relation to strip mining. Prog. Rep. to Decker Coal Company. 25 pp.

VTN Environmental Consultants. 1977. Wildlife-Spring Creek Project. Rep to Northern Energy Resources Co. 71 pp.